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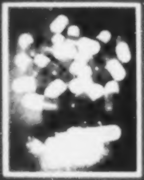

COVER

Poisoned Tylenol capsules.
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STRATEGIC RESPONSES TO PUBLIC CONTROVERSY

While there is no quick fix for resolving public crises, history does suggest some definite "dos and don'ts."

By John Holcomb

John Holcomb is an Assistant Professor in the College of Business and Management at the University of Maryland.

In 1973, Abbott Laboratories and Nestle Company were accused of using unethical marketing practices to sell infant formula in Third World countries. Critics claimed these practices, in effect, killed babies by encouraging the misuse of the product.

Since then, both firms have changed their marketing methods, and the public controversy has subsided.

What did the conflict cost the companies? It cost Abbott relatively little. Abbott lost no market share and emerged with high public credibility.

In contrast, Nestle's initial costs were high—in terms of both money and credibility. Unlike Abbott, Nestle faced a seven-year international boycott of its products which may have cost the company $40 million.

Why the difference? How did the firms respond to these public charges? Does one strategic approach work better than others in coping with political crises? Is there an historical pattern from which other companies can learn?

To try to answer these questions, I examined 15 cases[1] in which firms or industries handled political controversies caused by industrial accidents, product failures or environmental catastrophes. Six cases are presented here.

For each case, I determined how the company involved undertook seven strategic steps:

- Ascertaining the facts
- Portraying the problem
- Assessing the blame
- Responding to critics
- Adopting policy changes
- Instituting new procedures
- Choosing political tactics

Then, in light of the steps taken, I looked at what the controversy had cost the company in money and credibility.

What I found, in short, is that there is no quick fix for resolving political conflict. As I discovered, strategic responses fell into two distinct patterns. The first pattern correlated with high costs, as exemplified by Hooker Chemical Company, Firestone Tire and Rubber Company, and A. H. Robins Company, and the second pattern with medium to low costs, as experienced by Johnson & Johnson Company, Abbott Laboratories, and Nestle Company.

Hooker Chemical: Love Canal

More than 1,000 New York families were evacuated permanently when toxic wastes escaped from the Love Canal disposal site. The leaks brought a surge of medical problems, including birth defects, miscarriages, cancers, deafness, brain and nervous system dysfunctions, and severe headaches, when people breathed or came in skin contact with the chemicals.

The toxic waste crisis at Love Canal provides an example of the high-cost response pattern. The exposure of residents of Niagara Falls, New York, to 80 different chemical compounds leaking from the canal, a toxic waste dump once owned by Hooker Chemical Company, came to light in 1978. The *Wall Street Journal* reported that two years elapsed before Hooker Chemical offered its version of what happened. A senior vice president said it took that long to dig out the data and that "we

UPI Bettmann Newsphotos

Employee in Denver drug store pulls Tylenol from shelf after Chicago deaths.

Hooker may have been aware of the toxic hazards as early as 1958 . . .

were afraid to say anything that would turn out to be incorrect."[2]

In 1979, a year before the company presented its position, evidence emerged during a takeover battle that Hooker may have been aware of the toxic hazards as early as 1958, when children at the 99th Street Elementary School were burned by chemicals leaking on the playground. Hooker says it warned the local school board about this problem at the time, however, and that the situation was quite distinct from the larger problem of chemical migration.

Though the company had taken certain precautions before deeding the Love Canal property to the school board to build the school, it finally maintained, in 1980, that the fundamental problem could not have been known. The president of Hooker Chemical stated before the Commonwealth Club of San Francisco, "It is not fair to judge this or any other industry using today's standards applied to past practices or for not knowing what was unknowable at the time."[3]

Whatever Hooker's knowledge of the danger, within a month of its president's speech, the State of New York sued the company for negligence in failing to prevent migration of waste and in failing to warn the public of the hazards.

After taking so long to investigate and acknowledge the extent of the problem at Love Canal, Hooker Chemical also denied that the chemicals harmed anyone's health. Hooker's president stated, "The fact is that there is simply no reliable evidence to support the allegations of widespread health problems resulting from exposure to chemicals from Love Canal."[4] Furthermore, when a study commissioned by the Environmental Protection Agency found chromosome damage among Love Canal residents, Hooker responded that the study was "poorly conceived and executed" and that the "precipitous and poorly handled release" of the data caused "panic" among the residents, creating the need for their relocation.

While denying the seriousness of the situation, Hooker also denied responsibility for it. It instead blamed the local government and school board. In the

FOR SALE
8·2
CHEMICALS
You DIGEM

UPI/Bettmann Newsphotos

Chemicals from Love Canal leaked into Tim Moriarty's basement.

UPI/Bettmann Newsphotos

Robert Knott and family carry items from Niagara Falls home in which they may never live again.

deed passing the property to the school board in 1953, a provision stipulated that the board would assume the risk of any liability that might arise from its use of the property. Hooker argued that the design of the disposal site was well within existing federal standards and that the soil with which it was covered prior to the transfer was later disturbed.

A task force of the American Institute of Chemical Engineers concluded that the resulting predicament at Love Canal could be attributed to three factors: lack of monitoring of the site after it passed from control of Hooker, subsequent invasion of the site during nearby construction, and lack of remedial work after the site was disturbed.

The school board countered that Hooker never adequately warned the community of the nature of the hazards of the land it was donating.

Portraying the problem as not particularly serious and shifting blame to others led Hooker to a posture of self-defense toward its critics and various levels of government. The State of New York, the City of Niagara Falls, Niagara County, and the city's Board of Education sued Hooker, and Hooker sued them back. However, the company did not pursue the litigation to the very end, instead settling the federal and state lawsuits out of court in 1981. In exchange for dropping more than $600 million in damage claims against it, Hooker agreed both to create a plan for containing and cleaning up the 21,000 tons of waste at the landfill and to monitor the site for 35 years.

The company had made some conciliatory gestures earlier as well. In 1978, Hooker offered to pay one-third of the cost of a consultant's plan to solve the leachate problems, but the rest of the money was not forthcoming from the city and state. Regarding the lawsuits by 1,300 individuals against Hooker, the company settled those out of court as well, contributing $6 million to a settlement fund for area residents.

Though Hooker's short-run response was not especially novel, the company did institute an internal change, establishing a board of directors committee to monitor the impacts of its chemical products. Its use of political tactics, however, was quite conventional. Beyond its response to lawsuits, Hooker also made use of defensive political advertising.

Hooker handled this crisis at

The toxic waste crisis left a ghost town.

Michel Philippot/Sygma

Members of Congress examine damaged Firestone tire during hearing.

UPI/Bettmann Newsphotos

high cost to the firm and emerged with low credibility. Though it settled the lawsuits against it at minimal expense, its business performance was affected, with earnings down for three straight years from 1977 to 1979. Two books on Love Canal were written, both critical of Hooker and of the government.[5] Newspaper articles have continued to appear about Love Canal, one in 1984 stating New York officials still warn that the area is not safe enough for residents to resettle in the community. Meanwhile, the transfer of waste from Love Canal to another Niagara Falls site has contributed to the creation of another disposal problem.

The Hooker case not only put toxic waste on the front page, but also entrenched its hazards in the public mind. The broader impact was great. Love Canal was the major incident precipitating the passage of the chemical Superfund legislation in 1980, the provisions of which are again being debated in 1985. In effect, the Hooker case helped create the toxic waste issue that every chemical company and public official are now confronting.

Firestone: 500 Radial Tire

Blowouts, tread separations, hundreds of auto accidents, and at least 34 deaths were attributed to deformities in Firestone's model 500 series radial tire in 1978.

While Hooker Chemical Company failed to assess the dangers at Love Canal immediately, Firestone Tire and Rubber Company went even further to downplay the poor safety record of its model 500 steel-belted radial tire. Firestone actively resisted the federal government's requests to disclose such information. *Fortune* reported that when the National Highway Traffic Safety Administration (NHTSA) requested copies of consumer complaints of tire failure, Firestone insisted it could not supply the data without spending many months researching and compiling it.[6]

Meanwhile, the company kept maintaining that the tire was safe and that information criticizing the tire was inaccurate. Claiming NHTSA survey results to be unscientific, Firestone even sought a restraining order from a federal district court to keep the facts from the public.

While Firestone said the problems with the 500 tire were exaggerated, it blamed the consumer for those failures that did occur. Careless driving and failing to check tire pressure caused the problems, according to the company, despite survey results to the contrary from the Center for Auto Safety, a public interest group.

Furthermore, Firestone accused its critics of making a mountain out of a molehill. The company saw itself as the victim of a "Naderite conspiracy," in the words of the *Fortune* writer. The Center for Auto Safety, which collected consumer complaints about the tire, was originally a Ralph Nader organization. What's more, Joan Claybrook, head of NHTSA at the time, was

> **The company kept maintaining that the tire was safe.**

a Nader associate who is now back working for Public Citizen, Nader's umbrella group. Also, a key staff member of a U.S. House Commerce subcommittee who participated in the Firestone investigation is a former Nader associate.

Firestone also went beyond the posture of self-defense assumed by Hooker Chemical and initially engaged in more open confrontation with the government and other critics. Whether the enemy was NHTSA, the Congress or the "Naderites," the company's response took a hard line.[7]

Likewise, Firestone was even less willing than Hooker Chemical to adopt any policy change. In fact, after John J. Nevin became president of Firestone in 1979, he himself criticized the company for failing to voluntarily recall the 15 million tires before the government ordered that action in 1978. Since 15 to 20 percent of the tires developed structural problems, consumers and the government had adequate cause for alarm. Nevin said a voluntary recall would have prevented the company's image from becoming tarnished.[8]

In contrast, the tire industry at large did institute new internal procedures in the wake of the Firestone upheaval. Quality control was improved; for example, tires were X-rayed as they came off the production line.

After initially taking a confrontational stance, Firestone followed up with commonplace political tactics. It lobbied directly before Congress and NHTSA, insisting throughout that its radial tire was perfectly safe.

Although the cost to Firestone was not as high as it was to Hooker Chemical, it was still high. The company lost some of its share of the radial tire market, to the tune of "scores of millions of dollars" in sales, according to *Fortune*. Moreover, Firestone lost long-term repeat business—a survey by the Center for Auto Safety revealed that consumers with complaints would not repurchase from the company in the future. The company was also hit with 250 consumer lawsuits and eventually had to absorb the cost of the forced recall as well.

Partially as a result of the controversy, Firestone was "in desperate trouble," according to one business reporter, when Nevin took the helm. The new president, during 1980, led a dramatic turnaround in the company's performance, raising plant capacity utilization from 57 percent to nearly 90 percent, following austerity measures.

Clearly, a voluntary recall would have saved the company money and time. It also could have saved the company a loss of public acceptance. Even though the case didn't make the same long-lasting impression in the public mind as the Love Canal issue, Firestone was heavily criticized for the way it handled the case, even in the business press. The impact on the rest of the industry was minimal. All radial tires were not under attack as unsafe, only the Firestone 500. In fact, other tire companies gained, as Firestone's market share slipped.

A. H. Robins: Dalkon Shield

Over 12,000 women have sued A. H. Robins Company for pelvic infections, miscarriages, sterility, and deaths caused by the Dalkon Shield intrauterine device (IUD). Robins marketed the birth control product between 1972 and 1974.

Like Firestone, A. H. Robins Company attempted to suppress evidence questioning the safety of its Dalkon Shield. Initially, the company was passive in investigating the potential side effects of the IUD, even after buying the rights from the inventors in 1970. In fact, the company did not even have an obstetrician or gynecologist on its staff at the time.

Yet even as Robins readied the device for market, it acquired some information on the IUD's tendency to attract bacteria, an effect later implicated in many health problems and fatalities. The device's tendency to act as a bacterial "wick", according to *Forbes*, was reported in an internal memo five months before sales began, but the danger was not actively investigated by the company.[9] A year later, a quality control supervisor reported test results showing the same tendency, and he was fired. Moreover, the company failed to take any action based on the mounting criticism it began to receive from physicians as early as 1971, though it finally did commission studies and a conference while continuing to promote the IUD aggressively.

Robins never accepted any responsibility . . .

Robins did stop selling the IUD in 1974. But even after thousands of lawsuits and further steps to withdraw Dalkon Shields from use, the company still maintains the product is safe. Despite the IUD's unique design and its resultant problems, Robins' president stated in October 1984, "Our company has never viewed the Dalkon Shield as posing any risk higher than that associated with other IUDs."[10]

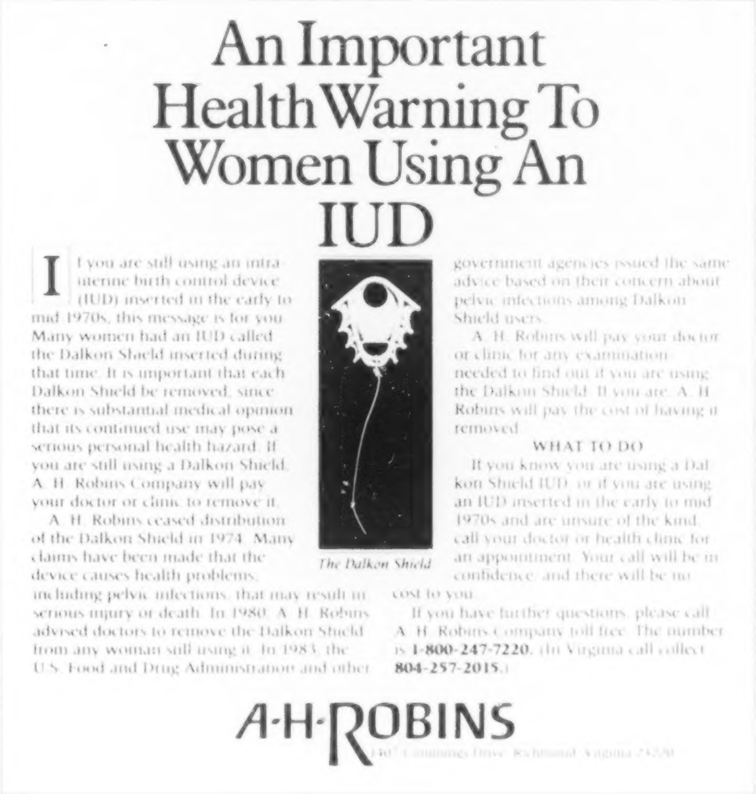
A. H. Robins has not blamed others for the controversy, as did Firestone and Hooker Chemical. There really were not other convenient parties to blame. As a legal tactic, though, Robins did question in some of the lawsuits whether the miscarriages might have been caused by other factors and whether the sexual activities of the plaintiffs might have caused the infections. In any case, despite its failure to conduct adequate safety tests before marketing the Dalkon Shield, Robins never accepted any responsibility itself for the problems attributed to its product.

Naturally the company assumed a defensive posture in the court cases. Still, some of its legal tactics bordered between simple self-defense and aggressive confrontation. For instance, even after the company stopped distributing all promotional literature for the Dalkon Shield in early 1974, it delayed taking the product off the market until later in the year for fear the action would look like a confession of liability, hurting it in the 47 lawsuits then pending. In addition, Robins' vice president and general counsel allegedly ordered the destruction of "legally damning" documents by a staff attorney during a 1975 trial.[11]

In a similarly defensive vein, in 1984 the company unsuccessfully lobbied for an amendment to the proposed Uniform Products Liability Act that would drastically reduce a company's liability to punitive damages in suits filed by consumers. Even Congressional supporters of the bill objected to the radical amendment, since it endangered the chances for overall passage; the bill was defeated.

Ten years after taking the IUD out of circulation in 1974, Robins finally adopted a policy change on the product, although it still defended the integrity of the Dalkon Shield. On October 30, 1984, Robins announced a program to pay doctors and clinics for medical examinations and the removal of any Shields from women still using them; print and television advertising has been spreading the word on the "recall." Otherwise, there is no evidence that Robins instituted any change in its decision-making structure or procedures following the controversy.

Ten years after... Robins "recalls" its product.



An Important Health Warning To Women Using An IUD

If you are still using an intrauterine birth control device (IUD) inserted in the early to mid 1970s, this message is for you. Many women had an IUD called the Dalkon Shield inserted during that time. It is important that each Dalkon Shield be removed, since there is substantial medical opinion that its continued use may pose a serious personal health hazard. If you are still using a Dalkon Shield, A. H. Robins Company will pay your doctor or clinic to remove it.

The Dalkon Shield

A. H. Robins ceased distribution of the Dalkon Shield in 1974. Many claims have been made that the device causes health problems, including pelvic infections, that may result in serious injury or death. In 1980, A. H. Robins advised doctors to remove the Dalkon Shield from any woman still using it. In 1983, the U.S. Food and Drug Administration and other government agencies issued the same advice based on their concern about pelvic infections among Dalkon Shield users.

A. H. Robins will pay your doctor or clinic for any examination needed to find out if you are using the Dalkon Shield. If you are, A. H. Robins will pay the cost of having it removed.

WHAT TO DO

If you know you are using a Dalkon Shield IUD, or if you are using an IUD inserted in the early to mid 1970s and are unsure of the kind, call your doctor or health clinic for an appointment. Your call will be in confidence, and there will be no cost to you.

If you have further questions, please call A. H. Robins Company toll free. The number is **1-800-247-7220.** (In Virginia call collect **804-257-2015.**)

A·H·ROBINS

1407 Cummings Drive, Richmond, Virginia 23220

Table 1

Strategic Responses to Public Controversy

Company	Ascertaining the Facts	Portraying the Problem	Assessing the Blame	Responding to Critics	Adopting Policy Changes	Instituting New Procedures	Choosing Political Tactics	Costs in Money/Credibility
Johnson & Johnson (Tylenol poisonings in 1982)	Internal tests	Serious problem	Blame others	Collaborate	Unilateral change	None	Ads, Self-reg	Low/Low
Abbott (Effects of infant formula marketing practices since 1973)	Internal & external tests	Serious problem	Limited acceptance	Collaborate	Unilateral change	Code of conduct, Decision structures	Self-reg., Negotiation	Low/Low
Nestle (Boycott and protest over infant formula sales since 1973)	Inactive	No problem	Blame others	Confront, Collaborate	Industry-wide change	Code of conduct, Decision structures	Industry self-reg., Negotiation	Med/Med
Hooker (Health effects of toxic waste at Love Canal since 1978)	Inactive	No problem	Blame others	Self-defense	No change	Decision structures	Ads, Litigation	High/High
Firestone (Forced recall of 500 radial tire since 1978)	Suppressed	No problem	Blame others	Confront	No change	Testing	Lobbying	High/High
A. H. Robins (Product liability suits against Dalkon Shield IUD, marketed 1972-74)	Suppressed	No problem	No blame	Confront	No change	None	Ads, Litigation	High/High

In launching the program, the company said it acted out of concern for the health of remaining Shield wearers and out of unwarranted adverse publicity. Miles Lord, the federal district court judge who heavily criticized Robins in 1984, disagrees, charging the action is an attempt to save the company money in the future and does not look beyond the bottom line.

The company resorted only to conventional lobbying and litigation tactics to defend itself. In fact, its aggressive stance on litigation prevented it from negotiating out-of-court settlements to the extent that Hooker Chemical did, at least until late in the game.

The cost of the controversy and the resulting litigation has been high. The 8,300 suits that have been settled to date cost the company and its insurer nearly $315 million. There are still 3,800 suits pending, and more are being filed at the rate of ten a day. A consultant's study projects another 8,300 cases could be filed before the Dalkon Shield episode is finally over. The average settlement has increased from $8,000 in 1976 to $35,000 in 1983, and in 1984 Robins paid $78 million in litigation expenses not covered by its insurance.

Johnson & Johnson has received accolades from the media, consumers, and the investment community.

The biggest expense of the controversy is a special "reserve fund" of $615 million that the company established in April 1985 to meet the "minimum" legal expenses it may face in the future. Despite the company's record year in sales and earnings in 1984, the reserve fund created a net loss of over $460 million, and it will prevent Robins from paying any dividends for the next two years.[12] Moreover, the reserve fund does not cover any punitive damages. In one Dalkon Shield case, a Denver jury awarded $6.8 million to a plaintiff, mostly in punitive damages.

There have been other financial expenses as well. Robins established a separate $6.9 million fund to reimburse any shareholders who bought company stock between 1971 and 1974. It also paid out $4.5 million for its new publicity campaign urging any woman using the Dalkon Shield to have it removed. The company has paid $1.1 million so far in removal expenses.

The controversy has also lowered employee morale and hurt the company's public image. The outcome has certainly been one of high cost and low credibility, although it took many years for the litigation to have an adverse impact on the company's income. An earlier voluntary recall might have cut Robins' losses substantially.

Johnson & Johnson: Tylenol

Seven people in the Chicago area died after swallowing Tylenol capsules that a saboteur had laced with cyanide.

In contrast to the ways in which Hooker Chemical, Firestone, and A. H. Robins handled their problems, Johnson & Johnson Company followed the low-cost response pattern in coping with the crisis arising from poisoned Tylenol capsules in Chicago, Illinois, in 1982.

Johnson & Johnson immediately launched an investigation to ascertain and assess the facts. It shut down its plants and warehouses and had trained dogs sniff for adulterated products. The company also offered a $100,000 reward for information about sabotage.

In this case, Johnson & Johnson admitted that a serious problem existed. Because it was able to establish that the pain-relief medication had been adulterated outside the company's production and distribution process, the company's self-interest was not hurt by acknowledging the seriousness of the situation. Since the incident clearly emerged as sabotage, the company was also a victim, and allocation of blame was not even an issue.

Rather than assuming a posture of confrontation or self-defense, Johnson & Johnson collaborated with the government and other parties, making this case a model of openness and honesty. The company cooperated fully with the Chicago police and with the Food and Drug Administration (FDA). The company hired an attorney in Chicago to work with the authorities and urged FDA to institute tamper-resistant packaging as a national industry-wide requirement. Johnson & Johnson was also open with the press and its own employees about the controversy, keeping them informed as events unfolded.

The policy changes adopted by Johnson & Johnson as the crisis broke were prompt and dramatic. The company launched an immediate and voluntary nationwide recall of all Tylenol capsules, then quickly developed and advocated the use of tamper-resistant packages. The fact that Johnson & Johnson instituted no changes in its internal procedures or decision-making mechanisms following the Tylenol crisis is really a reflection of the effectiveness of its existing systems. There was simply no need for improvement.

While voluntary self-regulation was Johnson & Johnson's primary tactic, it also used advertising as a supplement. But the advertising was not of the defensive sort used in other cases. Hooker Chemical had purchased full-page print ads explaining how it was not responsible for the Love Canal tragedy. Ten years after marketing the Dalkon Shield, A. H. Robins advertised to warn women to have the IUD removed. Meanwhile, Johnson & Johnson helped save the image of Tylenol with a series of trust-building ads in October and December 1982. The company also ran advertisements offering consumers $2.50 coupons to encourage the purchase of Tylenol.

In contrast to the other product failures, the Tylenol recall was a success. The withdrawal and disposal of the medication did result in an extraordinary after-tax cost of $50 million, or 22¢ per share, but the benefits were far greater. Johnson & Johnson suffered no long-term decline in its market share, as otherwise most assuredly would have occurred. Its market share did fall from 37 percent to 7 percent after the seven Tylenol deaths, but due to its prompt and responsible handling of the controversy and to its coupon program, the company's market share quickly rebounded to 30 percent and has grown ever since.

Moreover, Johnson & Johnson has received accolades from the media, consumers, and the investment community for its actions. Surveys showed that 90 percent of consumers did not blame the company for the Tylenol deaths. As a *Washington Post* reporter concluded, "Serving the public interest has simultaneously saved the company's reputation."[13] Johnson & Johnson handled the Tylenol controversy at reasonably low cost and emerged with high credibility.

To date, however, the identity of the saboteur is still a mystery.

Steve Leonard/Sygma

Johnson & Johnson cooperated with Chicago police and the FDA.

Abbott and Nestle: Infant Formula

Many poor, uneducated mothers in African countries gave up breast-feeding their babies in response to several companies' heavy promotion of infant formula as a more modern, sophisticated feeding technique. Without adequate instructions on how to use the formula, mothers often overdiluted the concentrated liquid and/or mixed it with polluted water. Untold numbers of babies became malnourished and died as a result.

In the early 1970s, health experts and religious groups charged Abbott Laboratories and Nestle Company, producers of infant formula, with unethical marketing practices. Their sales methods allegedly caused the misuse of infant formula in Third World countries, primarily in Africa, thereby leading to the malnutrition and deaths of babies.

Nestle Company initially resisted taking any action and attacked the integrity of its critics, a strategy which led to an international boycott of Nestle products. Meanwhile, Abbott Laboratories internally investigated both the marketing practices of the entire industry and the issue of infant malnutrition in Third World nations. Though it concluded that baby formula had a more beneficial impact than its critics portrayed, Abbott acknowledged that industry promotion posed a problem, even though Abbott was not implicated in aggressive marketing to

Union Carbide: Bhopal, India

It has been called the world's worst industrial disaster. On December 3, 1984, deadly methyl isocyanate gas leaked from a Union Carbide Corporation chemical plant in Bhopal, India, and soon killed 2,000 people and injured up to 200,000. Methyl isocyanate (MIC) is used in the manufacture of pesticides.

Union Carbide Corporation owns 51 percent of the Bhopal plant, with Union Carbide India Limited (UCIL) owning 49 percent.

Union Carbide made immediate moves to ascertain the facts of the tragedy. It certainly took the situation seriously, but did not say who it thought was ultimately to blame. Chairman Warren M. Anderson, however, said local managers were responsible for the Bhopal plant's maintenance and safety. Nevertheless, the day of the leak, Union Carbide halted MIC production in Bhopal and at a similar facility in West Virginia. Since then, some corporate policy changes have taken place as well as a number of defensive political tactics. Management has indicated an interest in settling claims out of court.

But a larger question has emerged that may cloud the legal picture for some time. This question is whether multinational corporations like Union Carbide are liable for subsidiary operations in Third World countries, particularly where hazardous activities are involved.

Reuters/Bettmann Newsphotos

Reuters/Bettmann Newsphotos

Bhopal clinic gives free medicine to residents affected by poison gas.

How will the controversy end? What will it cost Union Carbide? The following brief chronology shows the course of events thus far.

December 3, 1984
- Poisonous methyl isocyanate (MIC) gas leaks from Bhopal plant.
- 300 people reported dead.
- Operations shut down at Bhopal and at Institute, West Virginia.
- Carbide headquarters calls press conference to acknowledge disaster but does not speculate on cause.
- Voluntary safety inspection launched at West Virginia facility.

December 4, 1984
- Carbide's chairman Anderson and fact-finding team depart for India.
- Carbide announces intent to determine cause of accident, to aid victims, and to prevent further danger.

December 5, 1984
- Carbide president Alec Flamm briefs headquarters employees.
- Carbide stock plunges more than $10 a share to $38.75.
- Bhopal death toll hits 1,600.

December 6, 1984
- First damage suit filed in West Virginia.
- Anderson and team arrive in India.
- Carbide denies rumors of previous multiple deaths at Bhopal and of impending financial ruin because of tragedy.

December 8, 1984
- Anderson and Indian government officials in New Delhi discuss relief and compensation for victims.

December 9, 1984
- Anderson briefs Carbide headquarters employees.

December 10, 1984
- Carbide volunteers additional $1 million for UCIL's $840,000 short-term emergency relief fund.

December 13, 1984
- In-transit international shipments of MIC recalled voluntarily by Carbide.

December 14, 1984
- Anderson testifies before two subcommittees of U.S. House Energy & Commerce Committee on company's actions since 12/3.

December 18, 1984
- Most of remaining MIC at Bhopal plant safely converted into finished pesticide.

Abbott cooperated and negotiated with its critics . . .

the extent Nestle was.[14]

Abbott, a medical and pharmaceutical company, marketed through doctors and other health professionals while Nestle, a food company, marketed directly to mothers—often using Nestle employees dressed as "mother-craft" nurses to sell formula in hospitals and homes. Nestle portrayed itself as the victim of an activist group campaign to create an issue; Abbott admitted promotional deficiencies and recognized that the industry must shoulder much of the blame.

Throughout the first ten years of the infant formula debate, Nestle assumed a posture of confrontation toward its critics. In 1974, Nestle filed a libel suit against the Third World Working Group, a Swiss citizens' action organization, for a pamphlet it published titled "Nestle Kills Babies." An organization supported by Nestle also commissioned an article that appeared in *Fortune* called "The Corporation Haters" that attacked legitimate scholars studying the controversy and labelled religious organizations "Marxists marching under the banner of Christ."[15]

On the other hand, Abbott cooperated and negotiated with its critics. The primary protest and criticism Abbott faced came in the form of shareholder resolutions proposed by dissident church groups. The company negotiated a withdrawal of a resolution submitted by the Interfaith Center for Corporate Responsibility in 1977 by giving the group an opportunity to state its position to company shareholders in the house organ. As time went on, the critics were favorably impressed with some of Abbott's policy changes and with its enforcement of these changes.

Not until 1981 did Nestle collaborate with outside groups, a dramatic reversal from its previous stance. It sought out an ethical group that was "honestly investigating the issue" with which it could work in complying with a World Health Organization (WHO) marketing code that Nestle had endorsed. It chose the Methodist Task Force on Infant Formula, most of whose members were already boycotting Nestle. The company had also worked with its critics in developing the code.

Meanwhile, Abbott adopted new marketing policies, reducing the aggressiveness of its sales in the Third World and ensuring the safe use of formula. In so doing, Abbott distinctly chose a unilateral approach, since the International Council of Infant Food Industries (ICIFI), in writing its code, rejected the industry-wide initiatives Abbott originally wanted to pursue. Now in the late stages of the infant formula controversy, Nestle also is advocating changes of an industry-wide nature. By supporting the WHO code, Nestle wants to bind the entire industry to international marketing standards.

Abbott and Nestle also instituted structural innovations in response to the infant formula issue. Abbott formed a permanent management work team to study infant nutrition, infant

December 21, 1984
- Carbide praises Bhopal doctors and hospitals for quick, effective response to emergency.

January 8, 1985
- Standard & Poor's downgrades Carbide's debt rating. Company calls action "excessive."

February 8, 1985
- Carbide calls for new Clean Air Act legislation to protect public health.

March 15, 1985
- Company announces research program on toxicological effects of overexposure to MIC.

March 20, 1985
- Carbide releases investigative team's report that up to 240 gallons of water were "inadvertently or deliberately" released into MIC storage tank. Resulting reaction caused liquid MIC to vaporize and burst out of tank into atmosphere.
- Anderson notes corporate-wide changes implemented or planned in areas such as plant safety audits, employee training, and risk assessment.
- Carbide announces confidence in safety systems and procedures at West Virginia plant but will consider adding redundant systems.

March 23, 1985
- Legal claims from victims and shareholders filed in U.S. courts total $200 billion.

April 8, 1985
- Indian government files suit against Carbide in New York, after turning down Carbide's offer of $60 million up front and $180 million over next 30 years to settle claims.

April 24, 1985
- Settlement negotiations with Indian government remain stalled.
- Company says it is financially sound, with first quarter net income of $71 million, more than double from previous quarter.

May 4, 1985
- West Virginia plant resumes full operation.

E. Schwab/WHO

Infant formula manufacturers pressured many African mothers to give up breastfeeding.

formula, breastfeeding, and related matters in the Third World. Nestle also finally adopted a new organizational structure. In May 1982, it established a ten-member panel of scientists, clergy, and ethicists to monitor Nestle's compliance with the WHO code and to investigate complaints against its marketing practices. Called the Nestle Infant Formula Audit Commission, its chairman is former Secretary of State Edmund S. Muskie.

Regarding political tactics, both Abbott and Nestle practiced self-regulation combined with coalitions and negotiation with their critics. However, while Abbott pursued these tactics from the outset, Nestle did so only in the late stages of the controversy, after learning some early lessons.

In handling the infant formula controversy, Abbott absorbed minimal financial cost in changing its promotional practices and adopting a new marketing code. It lost no market share and emerged with high credibility, especially in contrast to the standard ways in which the rest of the industry reacted. Moreover, Abbott's voluntary marketing code and collaborative dealings with church groups may have prevented a boycott like the one Nestle faced.

Some estimates place the damage of the boycott to Nestle at up to $40 million. Other estimates maintain the boycott had virtually no effect. Beyond the immediate dollar costs, the protest and boycott undeniably consumed a large amount of executive time and attention. Nestle's response to the protest through the first eight years brought it low credibility, especially in the eyes of public officials, church activist groups, and the business press. However, the company's turnaround and collaborative dealings after 1981 eventually returned it to a high level of credibility.

Nestle's experience with the infant formula controversy and the ensuing boycott may be instructive for other firms and industries. Nestle mishandled the case for eight to ten years, which is an all too common scenario, and then reversed its course with some bold moves. After first denying or ignoring the problem of infant mortality, then blaming the controversy on church activists and labeling them Marxists, Nestle finally adopted a new strategy. With the advice of a full-time public affairs consultant experienced in food industry issues, the company organized the Nestle Coordination Center for Nutrition and began a series of initiatives. These initiatives included seeking out responsible activist groups with whom the company could work, endorsing the WHO code, and organizing an audit commission to ensure Nestle's compliance with the code.

The result? In early October 1984, the International Nestle Boycott Committee, "recognizing the substantial progress Nestle has made," announced the end of the boycott. Hence, a case that began in battle was resolved through collaboration and voluntary self-regulation.

Dos and Don'ts

The final question is—what works and what doesn't? Can we generalize? As these six cases demonstrate, and as supported by the larger study, public controversies usually are resolved most successfully—that is, with the lowest cost in money and credibility—if the company involved thoroughly investigates the facts, portrays the situation as serious, accepts some of the blame if guilty, and collaborates with its critics in solving the problem.

Table 1, ranking each company by its success and summarizing the strategic steps it took, bears out this generalization. The companies with the lowest costs, Johnson & Johnson and Abbott Laboratories, actively pursued the facts of the matter, characterized the problem as serious, collaborated with their critics, and changed their policies. Johnson & Johnson did blame others for the problem, but rightly so; Abbott accepted some of the blame for the infant formula controversy.

The remaining companies either failed to ascertain the facts or actively suppressed them. Likewise, they denied the existence of the problem and, with only one exception, eventually blamed others for it. They also tended to fight their critics rather than collaborate with them and to adopt no change in their policies.

The relationship between the tactics used in the final two steps—instituting new procedures and choosing political tactics—and the ultimate cost of the controversy to the company is less clear. There is no quick fix here. Procedural changes do not guarantee success. Similarly, the mix of political tactics might be different from one case to another. Political or issue advertising might or might not be helpful, although it seems to be more effective in explaining voluntary initiatives (e.g., the Tylenol ads) than in explaining a defensive position (e.g., the Hooker Chemical ads). Likewise, lobbying may or may not be useful.

Thus, from this study, it is more apparent which strategy to avoid than which to take. While there is no strategy that guarantees success, there is one that will virtually guarantee failure—suppressing the facts, denying the problem, confronting critics, making no policy changes, and attempting to resolve the controversy through litigation. In fact, if there is one single tactic to avoid, it is endless litigation. Companies that choose this path wind up perpetuating their problems, with the inevitable heavy toll in both money and credibility.

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ECONOMIC DEVELOPMENT—A RISING TIDE

Utility efforts to spur local development benefit the entire community.

By Doris Newcomb

Doris Newcomb is a freelance writer specializing in energy-related topics.

The central business district of Macon, Georgia, was once the primary location for the area's commercial establishments and financial, service, and governmental institutions. By the mid-1970s, however, its buildings and facilities had deteriorated. Retail customers were flocking to suburban shopping centers. Many stores moved out.

Downtown Macon's fate was shared by many other similar areas in cities nationwide. The growth in suburban residential areas prompted many businesses to leave, and inadequate financial investments made it impossible to maintain buildings properly.

But today, downtown Macon again is a busy, attractive part of the city, thanks in part to Georgia Power Company, which played a major role in a downtown revitalization effort.

Macon is one of eight medium-sized cities Georgia Power Company has targeted for downtown revitalization assistance as part of its community development program. "We recognize that we are in fact partners with the community and that we have a franchise to serve it," explains David Norman, manager of the company's Community Development Department.

Georgia Power's assistance includes direct improvement services as well as marketing efforts such as the nationwide "Downtown Georgia" advertising campaign to recruit businesses into central business districts. "The typical community development department is strictly in the marketing business—selling prospects to come into the community—but they can only sell a community to the extent that it is saleable," Norman says. "Our department is in the 'product development' business; our goal is to improve communities so they'll be more attractive for investment."

The Past Revisited

Until the 1973 oil embargo, most utilities actively promoted increased electricity use, conducting extensive advertising campaigns and other programs to encourage economic growth—and corresponding load growth—in their service areas. Many of the new generating units constructed to meet the steadily growing electricity demand were more efficient, reducing the cost of producing electricity and helping utilities keep rates stable.

After the embargo, however, many companies, faced not only with skyrocketing fuel costs but also with precipitous interest rates and proliferating regulatory constraints, cut back on promotional advertising and traditional economic development activities. Their focus shifted to conservation programs to help customers cope with rising electricity costs by reducing their consumption.

During these recessionary years, the economic health of many communities declined, particularly those in areas where sharp cutbacks in industrial production caused large numbers of layoffs. As a result, by the late 1970s many utilities were left with relatively large capacity reserve margins and underutilized facilities and equipment, lowering the efficiency of operations and forcing them to seek higher rates to cover fixed costs.

Consolidated Edison Company of New York

The Royal Ink Corporation of America was Con Ed's 2000th customer to qualify for a special electric rate.

Utility contributions to economic development can help stop the downward spiral . . .

To spur the commercial and industrial growth needed to revitalize their communities, utilities are turning again to economic development programs. Notes Bill Prindle, EEI Manager of Commercial/Industrial Programs, "In light of recent recessionary problems and load flattening caused by conservation, it's become apparent to utilities that they can't count on more people hooking up automatically, and that the key driver in economic development is jobs."

A utility company can affect the growth of its market in only two ways—by competing with other energy suppliers and by expanding the rate of economic activity. The first method, competing for an energy dollar that is split between electricity, gas, and oil, "is a grim and deadly battle in which somebody's going to lose," Prindle explains. The second, encouraging economic development, is not a zero-sum game. It operates like "a rising tide (that) lifts all boats," creating more jobs, a stronger tax base, and the means for a utility to improve its earnings while holding down rate increases.

In economically depressed areas, Prindle notes, utility contributions to economic development can help stop the downward spiral that occurs when electricity consumption drops and rates must increase to cover fixed costs, further decreasing customers' ability to purchase electricity. "By building on a community's remaining strengths, a utility can attract new economic activity, and all of a sudden you're in an upward spiral as more jobs are created and more people are available to share fixed costs," he says.

To create more job-producing enterprises in their service territories, utilities can attract outside employers, help start small growth businesses or get existing employers to expand their operations. A specific utility's approach, according to Prindle, depends largely on local conditions. For example, the major focus in the industrial Northeast—an area hard hit by the recession—is job retention. In the Southeast, a region that suffered less severely, the emphasis is on job growth.

The utilities with the greatest motivation to pursue economic development are those with excess capacity, notes Prindle. Utilities with relatively small reserve margins must encourage growth selectively to avoid increasing peak loads. Instead of seeking increased electricity demand, these utilities focus on improving their capacity factors by encouraging increased electricity use during off-peak periods.

Georgia Power Company

Georgia Power turned Macon's historic railroad terminal into new economic life for Cherry Street.

Revitalizing Macon

In Macon, Georgia Power Company's revitalization efforts began in the mid-1970s when it formulated a proposal to purchase and renovate a historic railroad terminal that was a major component in the city's rehabilitation plan. The city had purchased the terminal after Southern Railway moved its offices out in the early 1970s, leaving the terminal vacant. Under Georgia Power's proposal, the utility promised to develop the building by using part for its Macon Division offices and the rest for commercial space if the city and other businesses continued to improve surrounding areas along Cherry Street.

After the city accepted the utility's offer in 1981, Georgia Power included Macon in its pilot commercial development program for helping cities attract commerce to central business districts. The tools used to accomplish this goal included advertising, promotion, marketing, and the placement of tenants in various buildings. The company renovated the old railroad terminal and devised a plan for managing the revitalized area to attract customers. Today, the Cherry Street area is an attractive center for shopping and entertainment. Many specialty stores have moved into the area, and property values have increased.

The Community Development staff at Georgia Power includes an urban designer, an architect with a background in historic preservation, an urban economist, urban planners, and a former city administrator. Together, they provide businesses and local governments with a

Showing owners the advantages of rehabilitating buildings is a special Georgia Power service.

Georgia Power Company

wide range of direct services. For example, in one program focused on the advantages of rehabilitating a building, staff members use a special computer program to show property owners what the income would be from various investments. The staff also acts as a "resource broker," directing those who need help to the appropriate agencies, and, after a revitalization effort is completed, the department keeps track of further developments. "We stay on board and work with the local Georgia Power Company manager to make sure that he or she is plugged into the local leadership and knows how to get things done," says Norman.

In addition to its focus on community development, Georgia Power also works to attract new commercial and industrial customers. Programs aimed toward that goal are administered through the Industrial Development Department.

Incentive Rates

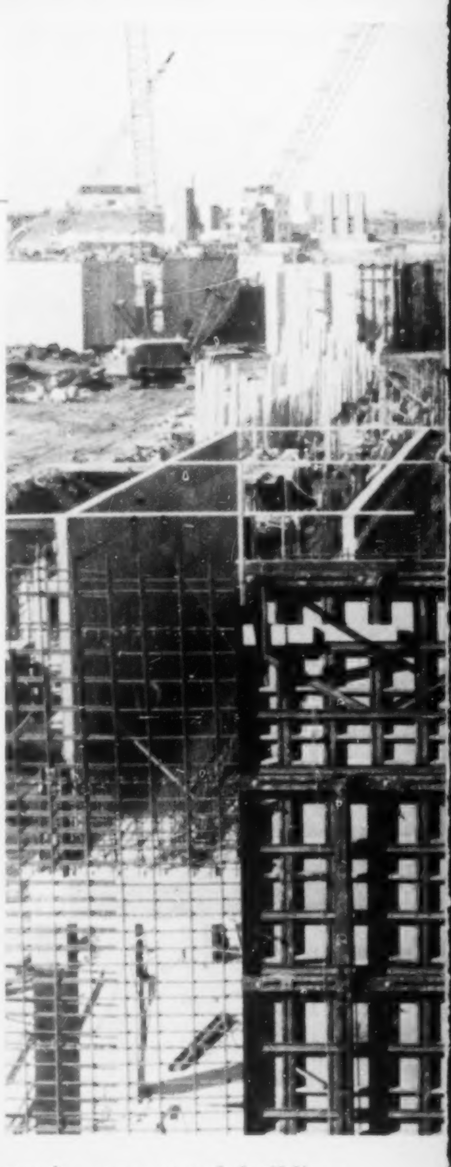
Macon, of course, is not alone in facing the problem of deteriorating neighborhoods. Many urban areas, especially in the traditionally industrial Northeast and Midwest, have seen their local economies decline since the early 1970s. The New York City metropolitan area is a prime example. To help reverse the decline there, the Consolidated Edison Company of New York, Inc., launched a program in 1981 to provide commercial and industrial customers who start, relocate or expand businesses in designated economically depressed areas with reduced electric rates.

According to the company's Manager of Area Development, John Manak, Con Ed was the first utility in the nation to offer incentive rates. "We had underutilized facilities in certain areas of our territory, and we recognized that if we could utilize that investment it would help all our ratepayers," he explains. "It would help create jobs and make the entire economy of our area healthier."

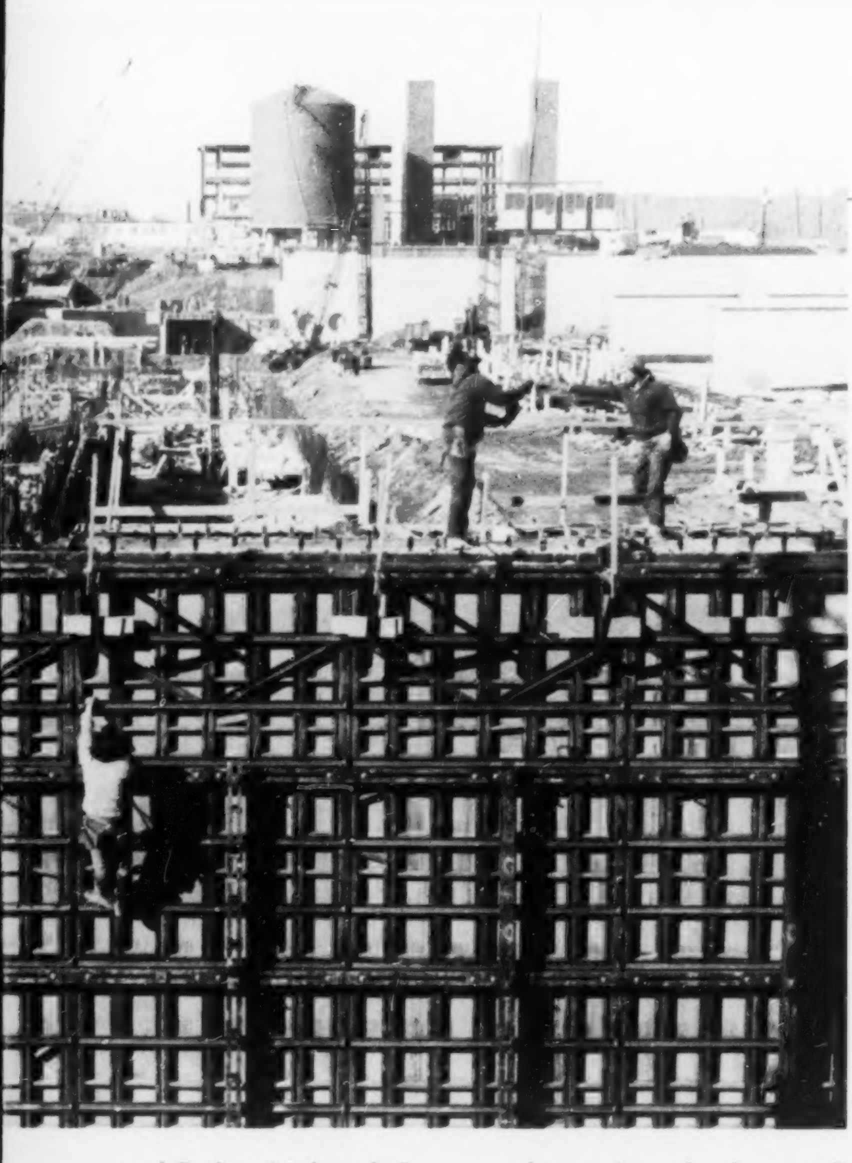
Initially, eight areas in the South Bronx and Brooklyn were certified as economically depressed by the city's Office of Economic Development. In October 1984, the program was expanded to include 18 underutilized areas in all five city boroughs. To qualify for the Con Ed special rates, electric load in the areas was no more than 50 percent of capacity, electricity use had to have declined by at least 20 percent in the last five to ten years, and each area had to be at least 90 square blocks in size to be administratively feasible for the program.

More than 3,000 customers currently receive rate reductions of up to 25 percent in electricity costs under the Area Development rate. Each customer receives maximum benefits for five years, with gradually declining benefits available for the following five years.

Con Ed credits the program with creating over 14,000 new jobs, and, to spur additional growth, the company recently began offering rate reductions to new occupants of vacant or newly constructed buildings. Benefits range up to 12 percent off electricity bills for those who occupy vacant buildings and up to 10 percent for occupants of new buildings. These Business Incentive rates require the building owner to be receiving local real estate tax incentives for a minimum of five years under New York state law and apply throughout the Con Ed service territory with the exception of midtown and downtown Manhattan.



To publicize its program,



Uniphoto

Con Ed's Project Appleseed has created 14,000 new jobs.

Uniphoto

Businesses that occupy vacant South Bronx buildings get up to 12 percent off electric bills.

named Project Appleseed, Con Ed has conducted extensive advertising campaigns and has established procedures for contacting potential users. "All new commercial and industrial customers automatically receive letters explaining the program and its eligibility requirements," Manak notes, adding that the reduced rates have raised few protests from either residential customers or other commercial and industrial customers "because the rates are set so that a customer carries all the costs for his or her service and makes a small contribution to income." Thus, full-rate customers are not subsidizing the incentive rates. In fact, the incentive rates benefit everyone by attracting new customers and spreading fixed costs over a larger base.

The Detroit Edison Company's recent experience with incentive rates also testifies to their success. The largest portion of Detroit Edison's sales is to industrial customers—about 50 percent—with 20 percent to commercial customers and the remainder to residential customers. Thus, when the automobile and steel industries closed a number of installations, laying off large numbers of workers, and other large industries moved out, the utility's sales dropped precipitously.

According to James Tuttle, Assistant Vice President and Manager, Marketing, for the company, an optional interruptible rate for qualified industrial customers is bringing an additional 150 megawatts of electricity demand on line. Another incentive rate, which eliminates demand charges under certain conditions, has made it possible for steel companies to increase their operations, rehiring many laid-off workers. Noting that the utility has provided assistance to companies that will create nearly 6,800 new jobs in its service area, Tuttle believes the company's efforts have helped the city regain its economic health and contributed to the upturn in electricity consumption in 1982.

Of course, incentive rates are just one component of the company's economic development activities. As Detroit suffered through the recessionary 1970s, The Detroit Edison Company quickly expanded its economic development activities, establishing an area development organization, adding personnel, and launching an extensive advertising campaign. Utility personnel established relationships with other economic development groups and with various state, city, and community organizations to promote development. At the same time, it began to concentrate efforts on attracting specific industries, focusing initially on petrochemicals. Since then it has expanded the list of target industries to include such fields as agribusiness and high-tech.

In addition to expanding its area development staff, Detroit Edison has hired six economic development consultants, one for each of its geographic divisions in its 7,600-square-mile service area. These consultants handle many of the economic development needs of division customers. In the future, Detroit Edison hopes to expand its efforts to place greater emphasis on providing aid to commercial customers.

Selective Growth

Utilities with relatively little excess generating capacity face special problems in promoting economic development. In capacity-constrained areas, most utilities approach economic development selectively. For example, the operating divisions of Texas Utilities Electric Company—Dallas Power & Light Company, Texas Electric Service Company, and Texas Power & Light Company—actively seek only those industries that will increase off-peak electricity consumption. The TUEC group simultaneously promotes programs to reduce peak electricity use. Pacific Gas and Electric Company is considering a

We're here to show you the sites, introduce you around and perform a little magic.

We're part of the Economic Development Team from Detroit Edison. Our job is to give businesses in Southeastern Michigan all the help they need.

Like sites, for instance.

If you've outgrown the facilities you're in now, we can show you larger sites. We'll escort you on a plant site tour, strictly confidential, of course. We know the communities that are looking for new business. And the realtors who have available land and buildings.

We know the right people, too. We know whom to contact at the local city and county government and Chamber of Commerce. No matter which part of our service area you want to locate in.

We know the folks in Lansing — exactly who to set you down with to work toward meeting your business needs. In short, we know how to cut red tape.

Add to all that, the personal service we deliver, including having a modern, reliable electric power system for your present and future needs, and you'll see why our Team is constantly on the go.

Call us next time you need a little magic performed. We'd love to amaze you. Write us, or call 313-237-8921.

Detroit Edison

Helping one another . . . Business to business.

Detroit Edison's advertising campaign entices new industrial customers.

Utilities with relatively little excess generating capacity face special problems . . .

program that, if adopted, would direct its efforts primarily toward retaining existing customers and shaping the load of customers with expansion plans.

Located in an area experiencing relatively rapid growth, TUEC has maintained an active economic development effort despite its relative lack of excess capacity. "The management of the company is dedicated to helping our communities, and it understands the need for economic development," explains Tom Heath, Director of Economic Development for Texas Power & Light. "If we're going to have a healthy and vibrant economy in our service area, then it behooves us to help get those jobs created."

TUEC actively seeks businesses that have high load factors as well as those that may be good cogeneration prospects. It provides them and all other prospective customers extensive information on the communities in its service area, including data on available buildings and sites, local taxes, transportation and educational facilities, wages, and other relevant information. "When industry representatives come to us with their requirements, we can look in our files and quickly tell them whether there's anything in the area that meets their needs," notes Heath.

According to EEI's Prindle, employers are attracted to a particular area increasingly by quality of life considerations in addition to considerations such as labor costs and transportation facilities. "In terms of community development, you've got to be able to show prospective employers why they should move there," he says.

To aid industrial customers further, TUEC offers them interruptible rates that are considerably below regular rates, thus encouraging increased development while providing the utility with a means to control peak load.

The program that PGandE is considering would foster growth in the off-peak period while controlling peak load. "The proposed program's goal would be to retain existing commercial and industrial customers and to work with customers expanding facilities to develop a load profile consistent with the company's load management objectives," says Don Bules, a PGandE energy services consultant.

According to Bules, forecasts indicate that the company's load factor will drop over the next ten years as peak electricity demand increases faster than average electricity demand. The proposed plan would be designed to help reverse that trend. "We would like to provide a combination of rates and incentives to alter our customers' load shape so that we're spreading the load over more hours, shifting as much of the peak load to off-peak as possible."

PGandE also is evaluating more traditional area development programs in which customers could turn to the utility for technical assistance in choosing sites and selecting technologies. Bules notes that such efforts under study would include the kinds of assistance provided by Georgia Power to its communities in meeting their development needs. "We would like our program to use the Georgia Power Company program as a model so that we have both a community development focus and an industrial development focus," says Bules. "Before they even bring a customer to a community and try to develop a partnership, they work with that community so that it can handle the increased demands placed on it."

Economic development activities vary widely across the nation, but they share one common attribute, according to Prindle: they benefit everyone. He says, "In the classic test of utility programs, regulators ask, 'What are the benefits to the people who participate, to those who don't participate, to the area as a whole, and to the company?' Economic development creates a rising tide—it lifts all those boats."

THE DIMMING OF AMERICA

Without regulatory reform, America may be headed for a dim tomorrow.

By Peter Navarro

Peter Navarro is a researcher at the John F. Kennedy School of Government's Energy and Environmental Policy Center and a teaching fellow at Harvard University.

This article is excerpted from Navarro's new book, *The Dimming of America: The Real Costs of Electric Utility Regulatory Failure.* It is published here with the permission of Ballinger Publishing Company. According to Navarro, political, institutional, and ideological forces are combining to suppress electric rates below the true cost of generating electricity. In response to this regulatory failure, utilities are pursuing a strategy of capital minimization that leads to higher fuel and capital costs and a less reliable electricity supply. America will ultimately pay the price for regulatory failure with higher rates, less reliability, reduced national security, and a weakened economy—unless she acts soon to reverse the current situation.

The electric utility industry is the energy cornerstone of the American economy. After a century of continual innovation and steady expansion, this industry now provides one-fourth of the power used by our homes, one-third of that used by our stores and businesses, and one-seventh of that used by our nation's factories and industries; its power plants and equipment comprise over one-fifth of the nation's invested industrial capital.

America's electricity supply is among the world's most reliable. With the flick of a switch, electricity feeds our vacuum cleaners, air conditioners, televisions, and stoves; it services our hospitals and schools; it lights our neighborhood playgrounds and streets; and it provides jobs and income for tens of millions of Americans. It is there when we need or want it, making our lives more comfortable, convenient, and in some cases, simply possible.

At the same time that it supports the nation's current high standard of living, electricity also promises to be the energy springboard for our future growth and prosperity. Already it serves as the basis for a wide variety of productivity-enhancing technological innovations and industrial devices, ranging from computers and robots to electric arc furnaces, advanced metallurgical processors, and lasers. It is revolutionizing such fields as telecommunications, transportation, agricultural irrigation, and food processing.

Unfortunately, after more than a decade of rapidly rising energy and capital costs, the electricity cornerstone is now threatened. Amidst the falling stock prices and bond ratings of a once blue-chip industry, the dimming of America—in the sense of massive electricity shortages and stoppages—has been predicted. . . . [S]uch warnings may be unduly alarmist, but . . . there is a great danger of a more figurative dimming of America. In this electricity future—which can be avoided—we may face the possibility of needlessly high electric rates, an unnecessary and increasing reliance on foreign energy, and reduced economic growth. A remote possibility also exists—in some regions of the country more than others—of periodic electricity shortages and, in the worst-case scenarios, resultant blackouts, rolling brownouts, and electricity rationing.

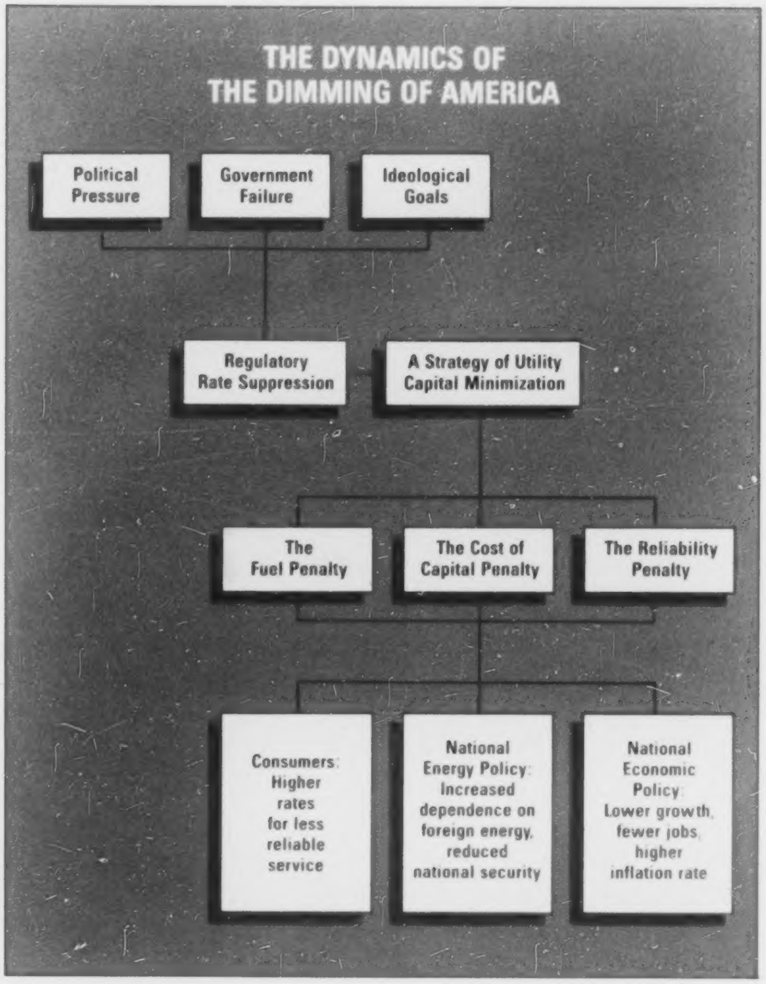
Driving America toward this dim future is a greatly flawed system of electric utility regulation, which, for a multitude of

Ed Castle

Will some of the lights go out?

largely misunderstood reasons, is unable to keep pace with abrupt and rapid changes in energy and capital costs and equally jolting changes in energy demand and use patterns. The result of this regulatory failure is "rate suppression," a pernicious phenomenon marked by electricity rates that continually rise but never fast enough to cover the true and steadily escalating costs of generating electricity. As a result of this phenomenon, and despite the fact that electricity rates have more than tripled since the early 1970s, many utilities have seen their real earnings cut almost in half.

In response to such rate suppression and the attendant erosion of utility earnings, today's electric utility executives have been increasingly turning to a "strategy of capital minimization." That is, because of new financial constraints, utility managers have been dramatically cutting back on the capital investments that are necessary to keep the lights on and rates as low as possible. These foregone investments include those that should have been made for reliability reasons (primarily new power plants to meet load growth) as well as those that are economic and so would cut consumers' electricity bills (projects ranging from coal conversion to conservation). Today, because of regulatory constraints, such investments are, from the utility executive's point of view, either financially unsound or financially impossible. . . .


THE DYNAMICS OF THE DIMMING OF AMERICA
Political Pressure
Government Failure
Ideological Goals
Regulatory Rate Suppression
A Strategy of Utility Capital Minimization
The Fuel Penalty
The Cost of Capital Penalty
The Reliability Penalty
Consumers: Higher rates for less reliable service
National Energy Policy: Increased dependence on foreign energy, reduced national security
National Economic Policy: Lower growth, fewer jobs, higher inflation rate

The Risk of Underbuilding

Prior to the 1970s, utility executives and engineers lived in a predictable world where the demand for electricity increased at roughly 7 percent a year with little fluctuation. Utility planners could plot this steady growth by drawing a straight, upward sloping line on a graph. Meeting customer needs was a simple matter of planning new power plants to meet the next point on the demand graph.

Today, the predictability of new capacity needs has gone the way of twenty-five-cent-per-gallon gasoline, as soaring energy costs and repeated doses of recession and "stagflation" have drastically altered the formerly linear pattern of electricity demand growth. As a result of conservation and the pressures of recession, the pre-1970s average rate of growth in electricity de-

Two of our largest states—Texas and California—will definitely face severe shortages . . .

mand has been cut almost in half to the rate of 3.6 percent. Moreover, this average rate is the product of very erratic growth rates in individual years. . . . In some years, such as 1972, 1973, and 1976, electricity demand growth has been as high as 6.3 to 8.4 percent. But in recession-plagued years such as 1974 and 1980, it has been close to zero and in 1981-82 even negative.

In thinking about the reliability penalty [created by the rate-suppression/capital-minimization syndrome], one important question to consider is to what extent conservation will continue to hold down the growth rate in electricity demand. In some quarters it is argued that through conservation and a leveling off of population, zero electricity demand growth is both feasible and desirable. In such a world, new power plants would be needed only to replace whatever capacity wears out.

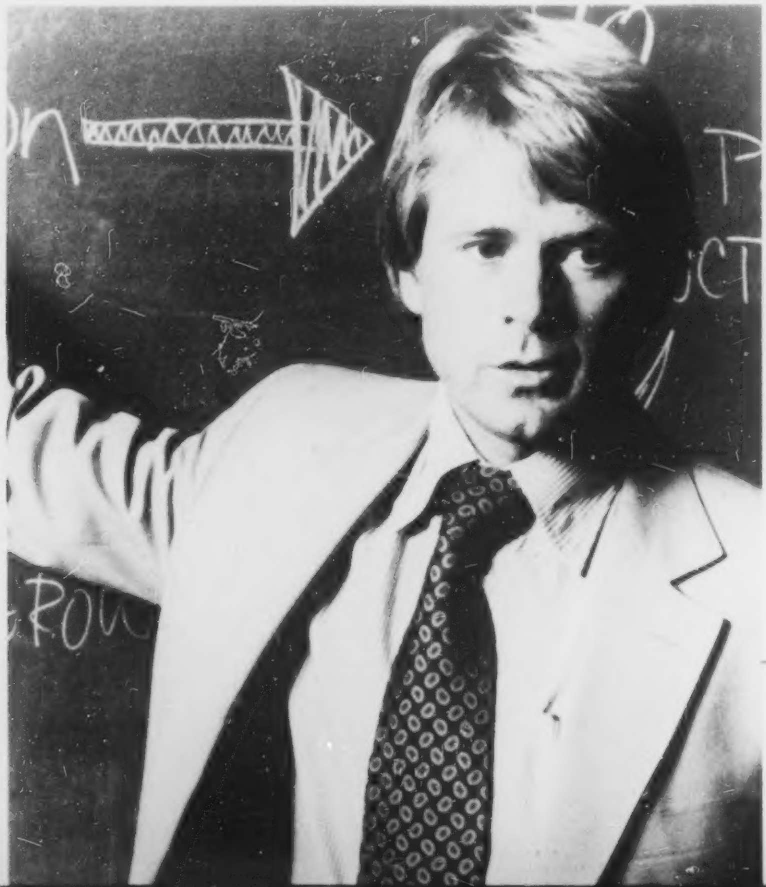
But most analysts are not so sanguine about conservation's potential to bring electricity demand growth to a complete halt. These analysts see the low growth rates in electricity demand during the 1970s and early 1980s as being attributable as much to economic recession as to conservation, and they point to the rebound of demand growth in periods of economic expansion to buttress their argument. These rebounds are marked by the higher growth rates such as the 6.3 and 4.6 rates in 1975-76 and 1976-77 and the latest case in point, the improved 3.6 percent annual growth rate observed in the later stages of Reagan's "economic recovery." (In the second half of 1983, in fact, electricity demand grew at a rate of about 8.5 percent over that experienced in the second half of 1982.)

Moreover, many analysts believe that the "quantum leap" gains from conservation have already been made so that its ability to drive demand growth down further is weakening. . . .

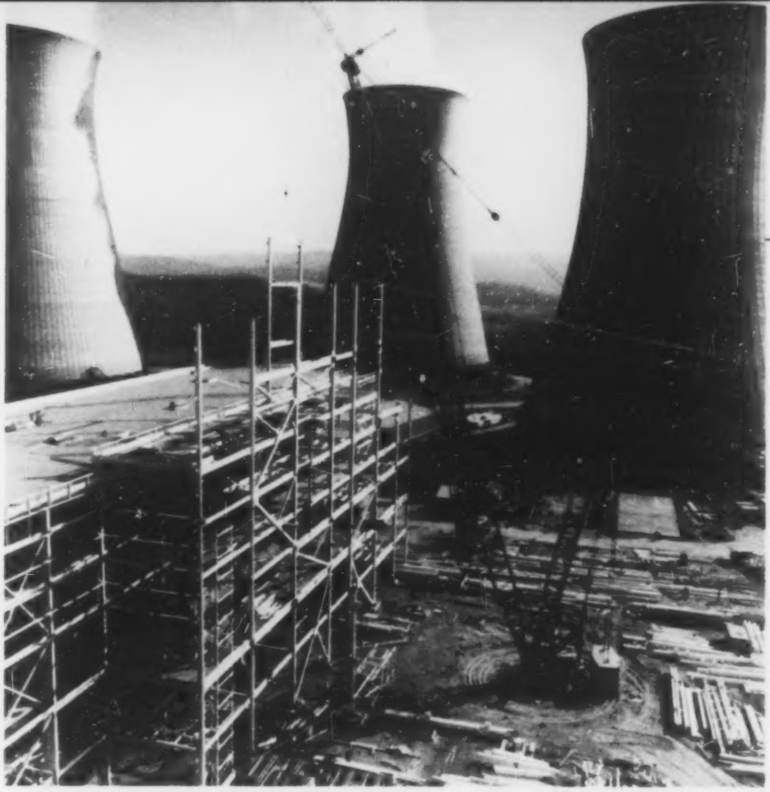
Accordingly, most analysts predict that demand for electricity will continue to grow at a rate of at least 3 percent per year and, if the economy continues to recover over the next few years, perhaps even higher. Among those making such predictions are the Department of Energy and the Electric Power Research Institute. Data Resources, Inc. makes a slightly more conservative estimate; it forecasts a 2.67 percent growth in demand through the year 2000.

Within the context of the rate-suppression/capital-minimization syndrome, these predictions are foreboding. For even with the demand growth of an earlier era cut by more than half, the required investment in new power plant construction to meet our future electricity needs is staggering.

At present, the value of utility assets exceeds $280 billion. But just to meet the requirements of a 3 percent annual growth rate, by the year 2000 the utility industry will have to build over 400 gigawatts of capacity, which is a hefty addition to its current capacity of roughly 650 gigawatts. To accomplish this expansion, it will have to invest a cumulative total of approximately $1 trillion (in constant 1982 dol-



Peter Navarro



New construction is lagging dangerously.

lars). That figure dwarfs the industry's existing asset base, which was $300 billion in 1981. Moreover, to meet future demand, the utility industry will have to begin to undertake such investments now. It takes a minimum of six to eight years to build a new power plant, and these lead times can, for a variety of financial and regulatory reasons, stretch to between ten and fourteen years.

Is there any evidence to suggest that the utility industry is moving forward to meet forecast demand? There is considerable evidence on the industry's prospects for supplying electricity, but it points to the unfortunate conclusion that some regions of the United States will be woefully short of new capacity to keep the lights on if the utility industry continues its unprecedented trend toward the cancellation, delay, and deferral of new construction. . . . [O]ver half of the new coal and nuclear plant capacity scheduled through 1988 has been delayed an average of 20 months, and from 1977 to 1982, about 140 generating units representing some 150,000 megawatts of electricity were canceled or deferred indefinitely. Further, no new nuclear units have been ordered since 1978, no new order for a major generating project was placed in 1982, and only one order was placed in 1983.

According to the Department of Energy, this pattern of cancellations, delays, and deferrals will almost certainly lead to serious supply shortages in some states and regions of the country by the early 1990s. For example, if electricity demand grows at only 2 percent a year, utilities in Kansas, Arkansas, Louisiana, the Dakotas, Minnesota, Iowa, Nebraska, and parts of Missouri and Mississippi will face a serious shrinkage of the reserve capacity (or "reserve margin") they have as insurance against power failures, a shrinkage which could lead to serious shortages, blackouts, and brownouts. Two of our largest states—Texas and California—will definitely face severe shortages in the 1990s if the trend of capital minimization continues.

Reliability versus Economic Reserve Margins

The seriousness of this situation in some regions of the country is masked by the fact that when the capacity situation is assessed from a national perspective, there seems to be a surplus of power plants. To avoid succumbing to the illusion of excess capacity and to fully understand the reliability penalty, it is useful to know how reliability is measured.

The most frequently used measure is a utility's *reserve margin*, which measures the amount of extra capacity that a utility has standing idle but that can be called into service should some plant or plants in the system fail. It is the percentage of capacity a utility has over and above its peak, or maximum, demand.

The traditional guideline is that a 20 percent reserve margin is sufficient to maintain system reliability. Margins above that rule-of-thumb level are supposed to signal "goldplating"—a utility's efforts to cram excess capacity into its rate base in order to boost its profits. But reserve margin calculations can be and have been interpreted erroneously.

For example, projections of the national average reserve

It is no longer correct to think of the 20 percent rule as etched in stone.

margin for 1990 are above 20 percent (assuming that the demand growth rate is 3 percent or less). These figures provide no hint of a problem. But they are deceptive, because the "national average" is a combination of both the seemingly high reserve margins in some of the more petroleum-dependent regions as well as the margins for those regions where an underlying reliability problem exists. When the high margins of such areas as New England and the Tennessee Valley are averaged in with lower margins elsewhere, the national average comes out at an apparently comfortable 33 percent.

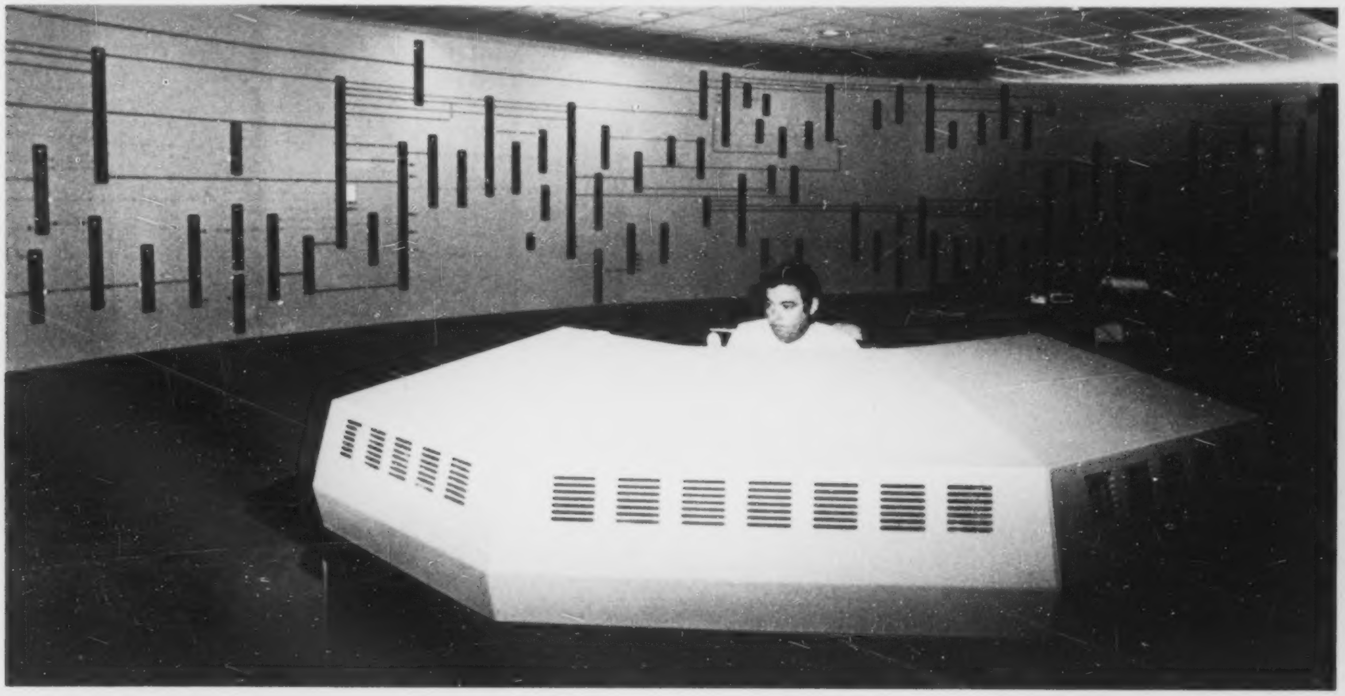
This figure ignores the reality that the "national" electricity grid that transmits power is not national at all. Rather, it is a loosely and incompletely connected *regional* grid system that lacks the lines and interconnections for adequately linking the supply-rich regions with the supply-poor ones.

For example, the transmission lines connecting the northwestern United States to California, which is a major potential victim of capacity shortfalls, have limited capacity, although they are likely to be expanded from 1,600 megawatts to 3,100 megawatts. Worse off is Texas, which for longstanding political reasons has a completely independent grid that renders it almost totally incapable of receiving power from other states.

Nor is the solution simply to build enough transmission lines to connect the have and have-not regions. Most of the extra capacity in the United States will, by the 1990s, be expensive oil- and gas-fired power plants. This is a subtle but extremely important point: while such power might be useful in a crisis (and probably will be used in a crisis, further raising the fuel penalty imposed on consumers), building transmission lines—which themselves require considerable investment—would be far more expensive than building new nonpetroleum capacity in the regions where shortages are anticipated.

The combustion-turbine strategy is not an economic alternative to electricity in short supply either. Under such a strategy, utilities would build oil- and gas-

Because the electricity grid is regional, power cannot always be dispatched from areas with surplus to areas with shortages.



fired turbines to fill the breach. Since these turbines are far less capital-intensive than, say, a coal plant, they can be up and running within a year or two. The obvious drawback of "CTs" is that because they are petroleum dependent, they produce electricity at a cost two to three times that of a coal plant. Would the industry install such petroleum guzzlers to keep the lights on? Most likely, since such a strategy was adopted in a similar period of crisis in the late 1960s and early 1970s when the industry purchased and installed some 35 gigawatts (the equivalent of 30 large coal plants) to ensure reliable service. While these combustion turbines saved on the reliability penalty, the burden of the shortage was merely shifted to the fuel penalty—and consumer bills. It would be unfortunate to repeat this mistake.

The reserve-margin rule is frequently invoked by opponents of new power plant construction who argue that conservation has made such construction unnecessary. But this concept, if adhered to, will have severe consequences for both ratepayers and the nation.

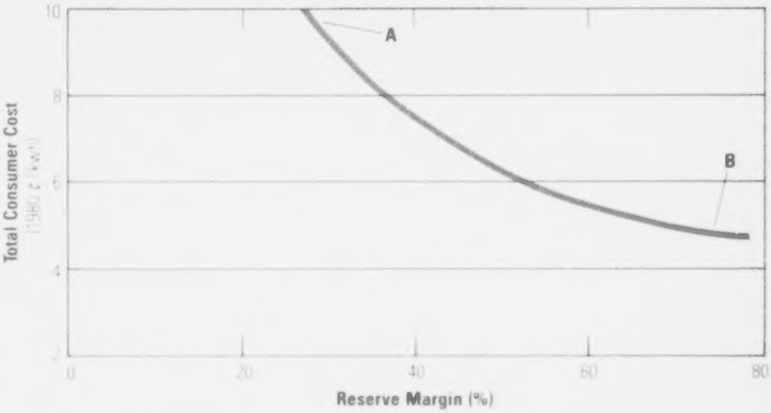
At one hearing before the Connecticut Public Utility Commission, the state's public counsel and PUC staff strongly opposed Northeast Utilities' request for a rate hike that would have facilitated the completion of Millstone 3, a large nuclear plant. The PUC's argument against the increase was that the addition of Millstone would have boosted Northeast's reserve margin to over 40 percent, excessive in its view. But according to testimony delivered by the U.S. Department of Energy in the hearing, the actual excess capacity would be noneconomic oil capacity, and the resultant savings of having the nuclear unit displace the oil capacity would actually reduce electricity rates below what they otherwise would be.

The crucial point this example illustrates is that the post-embargo economics of petroleum displacement require a more modern view of reserve margins. It is no longer correct to think of the 20 percent rule as etched in stone. Instead, it should be regarded as merely a lower bound, below which no utility would want to fall for reliability reasons but above which utilities may want to go for economic reasons. Thus, a utility heavily dependent on petroleum can in some cases build a new nonpetroleum power plant and double its reserve margin but still save ratepayers money; the petroleum plants would be put on standby, used sparingly (if at all), and gradually retired.

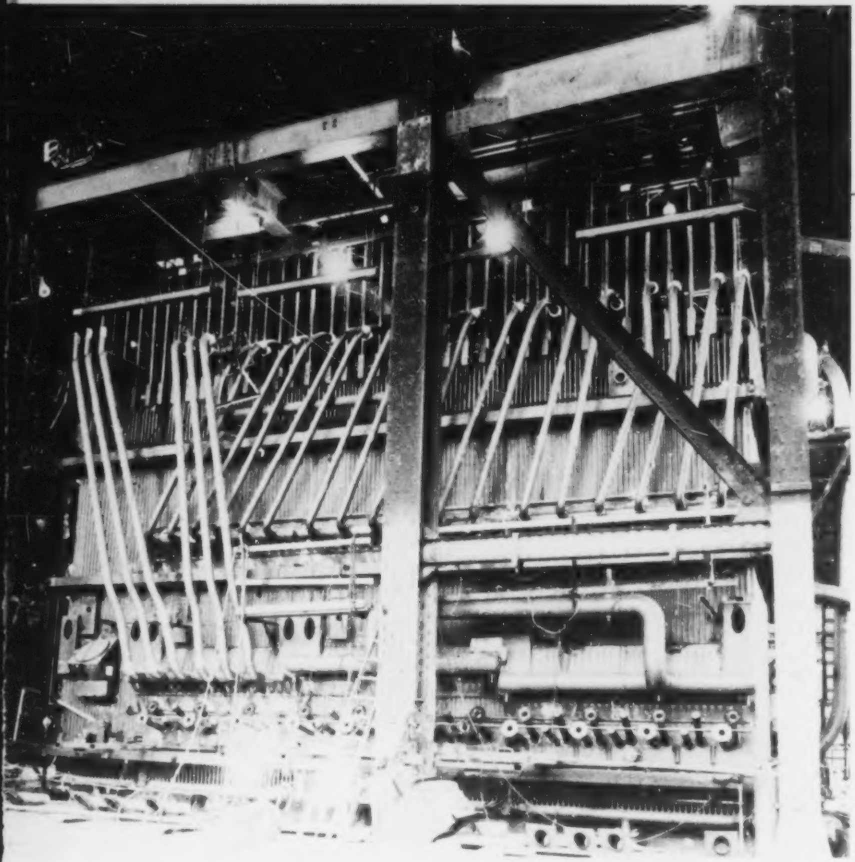
The Department of Energy's *National Electric Reliability Study* has brought this important distinction between "reliability" and "economic" reserve margins into sharp focus. The study analyzed a number of regions in the country to determine their economic reserve margins—that is, those margins that provided the lowest cost electricity generation. It found *no* relationship between the 20 percent reliability rule of thumb and the economic reserve margin. Instead, DOE found that economic reserve margins appear to be highly variable and largely dependent on the amount of petroleum in a utility's or a region's generation mix. The new rule of thumb

Figure 1

Economic versus Reliability-Reserve Margins: New England.



Source: The National Electric Reliability Study, Vol. 1, February 1980.



C E Gray Ltd

is that the economic reserve margin rises with the amount of petroleum in the generation mix.

Figure 1 illustrates the principle of economic reserve margins for New England, a region that depends on oil for more than 60 percent of its electricity generation. The vertical axis measures the cost to consumers per kilowatt hour, and the horizontal axis measures reserve margins. As new coal and nuclear capacity is added to displace existing oil plants, the region exceeds the 20 percent reliability reserve mark, yet electricity costs steadily decline. At a 27 percent reserve margin, the cost of electricity is 9.9 cents per kilowatt hour (see point A on the graph). This is the margin New England is scheduled to maintain through the next decade. If New England were to instead pursue the economics of petroleum displacement and build to a 78 percent reserve margin (point B), it could cut the cost of electricity by more than half, to 4.6 cents per kilowatt hour. Similarly, DOE found that for petroleum-dependent utilities in the southern California/southern Nevada region, the economic reserve margin was 70 percent, while in the Florida-Southern Company region, the lowest electricity costs were achieved at a reserve margin of 49 percent.

Thus, load growth is not the only reason to build new power plants. And reserve capacity above the percentage traditionally prescribed for reliability reasons is not necessarily extravagant. On the contrary, even very high reserve margins can be uneconomic. This fact lends justification for adding new capacity to displace petroleum.

Unfortunately, many regulators are reluctant to accept an economic determination of desirable reserve margins. State commissions typically allow in a utility's rate base only those assets that are "used and useful." If a utility builds a new nonpetroleum plant to substitute for an existing, economically obsolete petroleum plant, it faces a major risk: if the commission adheres to the traditional reliability view of reserve margins, it may deem the plant unnecessary from a reliability standpoint and not allow it into the rate base. Indeed, a 1980 decision by the Missouri Public Service Commission not to allow an *operating* coal plant into Kansas City Power & Light's rate base is evidence of the seriousness of this risk. The specter of being denied a return on new, petroleum-displacing capacity provides utility managers with yet another disincentive to undertake capacity expansion to eliminate petroleum economically.

Partially as a result of utilities' attempts to adopt this new concept of economic reserve margins, some petroleum-dependent regions of the country now have reserve margins well in excess of 20 percent. For example, in New York the reserve margin is about 40 percent, while in the Dakotas, Minnesota, Iowa, and Nebraska it is 44 percent. On the other hand, current reserve margins in California are not only below what is economic but also below the old 20 percent reliability rule. . . .

New technologies such as atmospheric fluidized bed combustion can help ensure reliable power.

Between Complacency and Crying Wolf

In considering the reliability penalty, one final comment is perhaps in order. America has never faced a serious electricity shortage. This is true despite occasional dire warnings by the electric utility industry that such shortages are just over the horizon. Unfortunately, the absence of serious shortages makes most of us oblivious to the dangers, just as most of us were unaware of the possibility of an oil embargo before 1973. Our resultant complacency is compounded by the industry's propensity to "cry wolf." But to paraphrase James Akins's comment on the Arab oil embargo, the rate-suppression/capital-minimization syndrome suggests that soon the wolf may really be here. [*Foreign Affairs* (April 1973): 462.] At least in some regions of the country, current forecasts point to exactly that conclusion.

The seriousness of such a conclusion behooves us to carefully assess the probability that the lights of America will actually flicker and dim. Given the recent proliferation of "quick and dirty" fixes such as expensive petroleum-fired combustion turbines and reserve petroleum capacity, we must also ask whether the lights going out is the real worry. Perhaps the dimming of America will occur in a more figurative sense, through an economically dark and drab future of soaring electricity rates, falling real incomes, fewer job opportunities, and slower growth.

Without an infallible crystal ball, the only way to predict what the future holds for us is to ask ourselves what must happen for electricity shortages first to occur and then to persist.

The first requirement is a continued growth in electricity demand in those regions most susceptible to supply shortages. Since the greatest levels of both economic and electricity de-

Regulatory failure will ultimately reduce America's standard of living.

This "seige mentality" is . . . a product of the pressures that the industry has been under for the last decade.

mand growth are forecast for precisely those states and regions where average reliability reserve margins are lowest, it is reasonable to conclude that this requirement will be met.

The second requirement is that utility executives in the most vulnerable regions must continue to pursue a strategy of capital minimization. That is, they must build no new plants (or fewer plants than necessary) to meet forecast demand. While again a crystal ball would be useful, the limited evidence we do have suggests that this requirement may be met as well, for in those vulnerable regions as in the rest of the country, new plants are also being cancelled, delayed, and deferred.

The third requirement is that utility executives must fail to react in time to prevent impending electricity shortages. From an economic viewpoint, that means in many cases failure to build new nonpetroleum plants such as coal capacity now and throughout the 1980s and 1990s. These plants would take anywhere from five to twelve years to complete and would be ready to meet growing demand in several decades to come.

From the standpoint of pure reliability, however, this reaction can also mean failure to build noneconomic combustion turbines even a few years before the actual shortages hit. Although electricity from these "CTs" would cost considerably more than new nonpetroleum plants (on the order of double to triple), they could in fact prevent the literal dimming of America.

It is likely that CTs will be built—but probably not until shortages actually hit. For one thing, federal law prohibits the construction of new petroleum capacity except in an emergency. Prospective or anticipated shortages alone are not enough to allow a waiver. Moreover, building CTs, despite their low capital requirements, is inconsistent with a strategy of capital minimization, so utility executives are likely to postpone making the investment until the last minute. They might even wait until their PUCs order them to build the CTs, because otherwise they run the risk that the PUCs won't allow the considerable fuel costs to be passed through to consumers.

Finally, utility executives have said on more than one occasion (although never publicly) that they are tired of environmentalists, anti-nuclear protestors, and consumer advocates telling them not to build new plants. Utility executives resent the implied usurpation of their prerogatives as managers and industry experts. In the same breath, they say that only a crisis such as a major electricity shortage will wake America up to the severe regulatory problems that exist. This "siege mentality" is, of course, a product of the pressures that the industry has been under for the last decade. It is as unconstructive as are the often bold accusations of the industry's critics. The bottom line of this seeming tug-of-war is a set of utility executives increasingly unwilling to make decisions that protect the public from a dark future but that are likely to draw the public's wrath.

Thus, shortages will occur in some regions, and these shortages will endure for one to two years—a short time in the scheme of things perhaps, but a fairly long time from the standpoint of politics. The literal dimming of America is therefore likely to be a relatively brief affair. Nonetheless, we should beware of the combustion turbine solution to the reliability problem, for . . . it will only hasten the economic dimming of America. ■

Uniphoto

HOW TO "GIVE AT THE OFFICE" WITHOUT WRITING A CHECK

Non-profit community-based organizations need more than money, and electric utilities can help.

By Clifford L. Alexander, Jr.

Clifford Alexander, former Secretary of the United States Army, is President of Alexander & Associates, Inc., a Washington, D.C.-based corporate consulting firm.

Non-profit community-based organizations are having the financial rug pulled out from under them. In addition to the same increases in expenses that have beset the rest of the business world, non-profits also are weathering recent and proposed cutbacks from governmental funding sources. Consequently, many of these organizations are targeting non-governmental sources for help.

The electric utility industry can take advantage of this opportunity to help. The goodwill generated by active involvement with community-based organizations is more than its own reward—in the long run, it is essential to the industry's success.

Aiding these beleaguered institutions will take leadership, imagination, personal skill, dedication, and—surprisingly—much *less* money than one might expect.

Non-profit community-based organizations have realized that even though money is *always* useful, it is only one approach to giving and necessarily the most passive approach. The private corporations and foundations that they have asked for contributions have, in turn, begun to ask them what they are doing to help themselves. As a result, non-profits are beginning to review ways in which they might "earn" money. They now seek new and more imaginative, practical, and integrated approaches to sharing the corporate largesse.

With these ideas in mind, Alexander & Associates, Inc., recently evaluated prevailing needs of certain non-profit organizations. Through telephone interviews with selected community-based groups, we identified their most pressing concerns and needs, asking, "What is the most valuable assistance other than direct monetary contributions that you could use right now from a corporation or business?" The cross-section of organizations surveyed was taken from the fields of education, social welfare, and health/medicine.

The results of the survey, taken together with other research and data, indicate that non-profits can and want to benefit in a variety of ways from corporate generosity. While a "need" was clearly established by all the organizations contacted, money was not the only source of help they suggested, even though many of them were experiencing financial difficulties due to budget cuts. Surprisingly enough, only one group said that money was its "first and foremost" need.

The largest number of responses to the survey came from educational organizations. Most of their executive directors were reached and replied to our questions during our initial phone contact. The majority of requests were for assistance in general management and business/office procedures and techniques. Heads of social welfare organizations were more difficult to reach, but once contacted, they were eager to engage in lengthy discussions about their needs and how the private sector could help them. More than anything else, these individuals cited a need for

The Detroit Edison Company

SUMM
Tone
Tone
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Jumbo Pak Napkins

Detroit Edison employees donate supplies to a local shelter for battered women and abused children.

equipment and supplies and for assistance in managing their large number of volunteers to optimize the success of their programs. The directors of health/medical organizations were the most difficult to contact. Those we were able to reach emphasized their need for office personnel and equipment, and all noted the need to increase the efficiency of their fundraising efforts to maintain the vitality of their research programs.

Among the groups contacted, the largest need was for management training and development. Budget cutbacks and shrinking funding sources have forced these operations to look at ways to improve their internal organizational systems to maximize the "profitability" of their programs. To this end, executive directors overwhelmingly voiced the need for in-service training for everyone from volunteers to boards of directors and their committees. Such training would enhance the utilization of their employees and make them more effective in their present positions.

For example, these groups are interested in maintaining and improving employee morale, just like for-profit enterprises. High morale translates into more productivity and less turnover, which in turn allows organizations to concentrate on their goals and objectives. Consequently, their managers need and want training in employee motivation and appraisal, time management, and staff interaction. Many also expressed a particular need for knowledge

The Cleveland Electric Illuminating Company: Lending Computer Expertise

John Stolarski put the Taylor Center on-line.

The Cleveland Electric Illuminating Company's John Stolarski knew very little about managing the files of the Murtis H. Taylor Service Center two years ago, but he knew practically everything about organizing the utility's records.

Using his experience as a computer expert responsible for 700,000 monthly bills, Stolarski helped the Center, a halfway house for mental patients, to put its patient and accounting records "on-line."

The United Way's loaned executive program brought the Center staff together with the knowledgeable computer pro. "The Center wanted to go from manual record-keeping to computers and we had the expertise. My task was to assist in the conversion," said Stolarski. So every Wednesday afternoon for six months he volunteered nearly three hours to the Taylor project.

"John was a very important help to us because he had the expertise we did not have," commented Riaz Ahmad, director of research and evaluation at the Center.

During their weekly conference, Ahmad and his co-workers discussed their computer problems with Stolarski and listened carefully to his advice.

"We sat and talked and looked at potential solutions. They made the decisions. It was a good approach," Stolarski said.

The Center, which is funded by state and private sources, is located in "a poverty area on the south side of Cleveland and provides outpatient services for a region of Ohio," Ahmad said.

Stolarski was not the first CEI executive loaned to public service agencies hungry for management skills and expertise. "We loaned a specialist in communication, and our chief executive recently headed a long-range planning task force for United Way," said company spokesman Stephen G. Lorton.

Alexander & Associates, Inc.

Clifford L. Alexander, Jr.

about techniques used in developing and managing volunteer staffs, since these play a special role in the non-profit sector.

Included in this arena are community hospitals and health clinics, which typically offer an abundance of both medical and non-medical services. In many ways such organizations often act as a community base, employing scores of paid and volunteer workers and acting as a liaison in community outreach programs. With continual budget cuts, however, many of their programs and services are being reduced or eliminated, and often employee training programs are among the first to go. Corporate-sponsored writing classes for ancillary personnel, for example, could give employees new skills to help them do their jobs more effectively.

Non-profits are also examining ways to generate their own revenue, and the need for information and assistance in fund-raising techniques was mentioned consistently by those interviewed. Non-profits need to know how to solicit technical assistance and funds from corporations, and they need to know how corporations "feel" about such solicitations. As one director put it, "We need the advice of knowledgeable people who can give us leads on where to get money." In addition, a few directors suggested that corporations may want to provide income-generating alternatives and venture capital toward self-sustainment for not-for-profit organizations.

A large number of those contacted also expressed a need for training in financial management. In particular demand is information on financial systems and planning and on the "nuts and bolts" of fiscal management, such as budgeting, bookkeeping, and accounting. Among the specifics mentioned were help in organizing a financial plan to buy property and build a permanent office and advice on budget management to optimize the use of donated monies.

Consulting assistance in computerizing their operations was another need identified by many organizations. While most stressed the need for professional advice to help them select the best system for their unique needs, they also indicated the need for actual hardware—including word-processing equipment and microcomputers—as well as appropriate software.

Similarly, the need for office equipment was mentioned frequently, including audio-visual equipment, furniture, office supplies, vans, heaters, refrigerating units, typewriters, duplicating equipment, video cassette recorders, and telephones. "We need all types of office ma-

Vern Chamberlain, UP&L retiree, helps kids learn woodworking skills.

Utah Power & Light Company

Utah Power & Light Company

Leo Poulson, retired from UP&L, tutors third graders.

chines," noted one director, hastening to add, "but we don't want company 'throw-aways'—it costs too much to repair them."

Finally, it is important to note that a large percentage of the organizations surveyed expressed a need for assistance in keeping publication costs down. All of them publish at least one of the following: newsletters, magazines, pamphlets, bulletins, journals, handbooks, proceedings, flyers or books. Most also publish convention or meeting materials. Moreover, much of their fundraising is done through direct mail. The costs associated with these necessary publications can be quite significant. According to one respondent, "Publishing is our main expense, and help in any aspect of it would be invaluable." Such help could range from advising non-profits about how to solicit bids from typesetters and printers to actually providing those services with corporate resources.

The benefits of corporate goodwill are legion. Altruism aside, it is simply a matter of enlightened self-interest for a utility to be involved with community-based groups. Through such an alliance many mutual goals can be met. Non-profits could receive corporate expertise through the donation of assistance, consultation, and planning. Unlike money, information is a commodity that is not diminished when shared—instead, it provides many dividends to the donor. Such donations would not tax the budget of the utilities involved yet would prove useful as a key to the long-term self-sufficiency of any not-for-profit organization concerned. The obvious result of these services would be fewer fiscal demands made upon the company in the future.

Also, for the utility, the usual benefits of corporate image enhancement are augmented by other equally worthwhile advantages. First, non-profits generally thank a corporation publicly. This unique form of corporate public relations is highly valued because it forges a much stronger link between corporation and community. Any help given by utilities will serve to enrich the lives of their customers and make utilities' work seem more important as a part of each person's day-to-day life.

Second, corporate outreach programs are an excellent way

Non-profits generally thank a corporation publicly.

of encouraging employees to feel more involved with their company. Through such programs not only is the utility publicly praised, but by implication so are the individual employees. The result is that the employees feel good about their skills, their work, and, perhaps even more importantly, themselves. These feelings can easily translate into tangible results on the job. Furthermore, because they have taken an active part in their community *through* their workplace, utility employees may realize more fully that their company cares beyond corporate dollars and cents. The programs can embrace retirees as well

Third, where employees of a company and their families represent a significant part of a local population, the work donated to non-profits becomes doubly important, for the sense of community is reinforced. Employee input in program development can even more readily target the specific needs of the

Portland General Electric: Sponsoring Health Seminars

Geriatric specialist Arlene Whyte said Portland General Electric Company's seminar on hypothermia enabled her to prevent four deaths.

"There were four people in my area who I spotted because of the program I attended and it saved their lives," said Whyte, a counselor at a mental health center which treats 200 elderly people a month.

One of the symptoms of hypothermia, a condition in which the body becomes abnormally cold, is dementia, she said. As the body ages, it generates less heat internally, so older people are easily affected.

The four hypothermia sufferers were brought in to Whyte's clinic because they seemed to be crazy. "One woman came in unable to dress herself. She could not answer questions such as 'what is the day of the week?'" Whyte said.

Fortunately, Whyte knew about the effects of hypothermia because of the utility's seminar. "I asked for an internal temperature to be taken and found she was hypothermic. After three weeks of care she went home much better," Whyte said.

Before the seminar, "I knew very little about hypothermia. It was an excellent, excellent program. I took it with other health care professionals, and I think sponsoring it was above and beyond the call of duty for Portland General Electric," she said.

Locally, little was known about accidental hypothermia at the time the utility decided to sponsor this seminar, according to Nancy Byrkit, spokeswoman for the company.

"We used a program developed by the National Center for Accidental Hypothermia. Their director, Joyce Harmon, came out to give the presentation. We also got one of our local doctors recognized for his experience with hypothermia due to outdoor exposure to provide some background and relate his concern," Byrkit said. "The focus was on care providers such as nursing homes, adult foster care centers, and home care services. The idea was to make professionals aware of symptoms and how to respond."

"The elderly usually don't move as quickly as when they were younger, and their circulation may not be as efficient. So we have continued to provide hypothermia information to those who request it since that first large presentation. Another part of our concern is putting the information into a less technical program for older audiences in general. This includes, among other things, counseling them to wear more clothing in layers and to sleep with a cap on. We've had an opportunity to share some basic but little known information with many of our customers as well as those who provide services for them."

During the last three years, the program has been given for about 2,000 people. The inspiration for it came from the utility's senior citizen representatives.

UP&L retiree LaPreal Crystal supervises a classroom session.

Utah Power & Light Company

community-based organization. A fourth plus is the fact that such public relations can also play a major role in recruitment. A company's reputation is an important factor in attracting a high caliber employee. Utilities with solid reputations in community affairs are far more likely to attract "the best and the brightest" people into the industry.

It is probably safe to assume that every community-based organization in the United States will be concerned to some degree with future funding. For this reason, the corporate outreach programs of the electric utility industry become crucial to their survival. Through the industry's assistance, non-profit organizations can be a force in creating a strong and united community by helping others and, in turn, by helping themselves.

Utah Power and Light Company: Tutoring School Children

Sterling Hixson has two important skills: he is good at math and he knows how to reach out to neglected and lonely students who do not want to learn.

Hixson, 72, one of Utah Power and Light Company's senior volunteers, has spent many hours since his retirement in 1978 coaching junior high school students in math.

"If there is a student who is slow, I sit down with him at a desk and help him see through it," said Hixson.

Hixson has "lots of math tricks" which he picked up in his 40-year career as an electrical engineer with the Utah utility.

At retirement, Hixson was working as Utah Power's chief dispatcher, directing the flow of electricity from the company's power plants through its high-tension lines.

Hixson "is a wonderful volunteer," according to Margaret Hunt, coordinator of the utility's public education office.

"The schools tell us their needs and we use Utah P&L retirees. We find those willing to help students and place them with a school," she said.

"We have retirees in four schools. I keep in touch with them, helping with any problems and getting those little success stories," Hunt continued.

Hixson's success began with his assignment to Glendale Intermediate School, which is located on the poorer side of Salt Lake City. The student population is widely mixed, ranging from Samoans to Mexicans.

On and off for the last seven years Hixson has patiently helped students learn math and a little about growing up.

"There was one girl whose mother died. She wouldn't work and the teacher looked to me for help. I went to the girl and asked her, 'What's the matter?' She explained about the death.

"I said, 'Young lady, you're not the only one in the world who is unhappy. I lost my mother when I was five. You're 13 and have a much better start on life,'" Hixson said. "I worked with her and got her going."

Another student neglected his math even though he said his greatest hope was to become an airline pilot. "I told him he could not even set foot in a cockpit unless he mastered math."

Hixson applauded the program which has brought him such satisfaction. "Utah P&L has done a tremendous job here. They've got lots of employees involved."

REVIEWS

REGULATORY REVIEW

Table 1
1984 Quarterly Electric Rate Actions

	Increases Filed During Period		Total Increases Pending at End of Period		Increases Approved During Period	
Time Period	**Number**	**Amt ($000)**	**Number**	**Amt ($000)**	**Number**	**Amt ($000)**
First Quarter	28	2,446,148	132	9,966,204	59	1,337,324
Second Quarter	36r	2,513,002r	127r	9,450,073r	49r	1,137,321r
Third Quarter	33r	1,337,876r	114r	8,047,881r	36	1,138,315
Fourth Quarter	22	1,215,409	101	7,875,433	42	1,132,076
Twelve Months Ended 12/31/84	119	7,512,435			186	4,745,036

r = revised from previously reported data

1984 RATE ACTIONS SLOW

Investor-owned electric utilities were granted $4.7 billion in rate increases in 1984, the lowest amount since 1979. Requests filed during the year totalled $7.5 billion, down from the record-breaking $12.8 billion filed in 1983 and the first drop in eight years. (See Table 1.)

The lower dollar volume of filings was due primarily to the lower number of filings. In 1984, 119 requests for rate increases were filed, down from 186 in 1983 and the lowest number of filings since 1972.

Several factors worked to lessen many utilities' need to seek rate relief—declines in projected construction expenditures, recent completions and cancellations of major construction projects, lower interest rates, and the containment of operation and maintenance costs.

At the close of 1984, 101 requests for rate increases totalling $7.9 billion remained pending. By comparison, 1983 closed with 147 requests pending which totalled $9.7 billion, a record amount. The last year in which the volume of cases pending at year end was lower—$2.9 billion—was 1979; the last year in which the number of cases pending was fewer—99—was 1972.

Returns on common equity allowed by state commissions during 1984 averaged an estimated 15.2 percent, down slightly from 15.4 percent in 1983. Based on preliminary information, the composite return on equity earned by the industry in 1984 was 14.5 percent.

The return on average common equity allowed during the fourth quarter of 1984 averaged 15.5 percent. Utilities filing applications for rate increases during the quarter requested an average return on common equity of 16.2 percent. Regulatory lag during the quarter averaged an estimated 7.9 months. ▰

Contributed by the Rate Regulation Department and the Finance Department of Edison Electric Institute.

REVIEWS

FINANCIAL REVIEW

1984 ELECTRIC OPERATING REVENUES UP 9.2 PERCENT; INDUSTRY EQUITY RATIO REACHES 41.2 PERCENT

Earnings per share of the investor-owned electric utility industry increased 5.7 percent during 1984, reaching $3.13, up from $2.96 in 1983. The 17 cents net per share growth in earnings resulted primarily from increases in income from electric utility operations. Non-electric utility operations contributed 5 cents per share; other non-utility operations contributed 3 cents per share. (See Table 1.) Interest expense and charges and preferred dividend payments were up 4 cents on a per share basis.

The increased earnings were also reflected in the industry's balance sheet, as the industry's equity ratio reached 41.2 percent, up from 40.8 percent at the end of 1983. (See Table 2.) The return on average common equity increased to 14.5 percent from 14.4 percent in 1983.

Total electric operating revenues increased 9.2 percent to $119.5 billion in 1984 as the economy continued to recover from the recession of 1982–83. Total sales of electricity increased 5.8 percent to 1,736 million megawatt hours on the strength of a 7.8 percent growth in sales to economy-sensitive industrial customers.

Electric operating expenses increased 8.8 percent in 1984 to $96.6 billion. Fuel expense increased 3.7 percent to $37.5 billion in 1984 after declining 2.7 percent over the preceding two years. Even so, fuel as a percent of total electric operating expenses declined to 38.8 percent in 1984, from 40.7 percent in 1983. Non-fuel operation and maintenance costs increased 12.2 percent.

Total current and deferred income tax expenses increased 17.0 percent. The current portion of the industry's total income tax expenses (i.e., the portion accrued to be paid currently for 1984 operations to federal, state, and local governments) increased 31.5 percent in 1984 to $4.5 billion.

Electric operating income increased 10.6 percent in 1984 to $22.8 billion from $20.7 billion in 1983. Other utility operating income increased 36.3 percent in 1984 to $1.5 billion. Total utility operating income increased 11.8 percent, or 15 cents per share, to $24.3 billion in 1984. Non-utility income increased nearly 20 percent to $2.1 billion.

The quality of earnings as measured by the amount of allowance for funds used during construction (AFUDC) in net income improved in 1984. Total AFUDC increased 6.0 percent to $8.5 billion in 1984 compared to a 17.4 percent increase in 1983. However, the discontinued accrual of AFUDC by some companies due to plant cancellation undoubtedly affected the 1984 increase and put downward pressure on the annual increase in earnings. AFUDC as a percent of net income available to common shareholders declined to 49.9 percent from 53.7 percent in 1983, the lowest annual level in five years. Total AFUDC per share of common stock actually declined three cents in 1984.

Pre-tax interest coverage based on electric operations (including AFUDC) improved to 3.09 times interest charges during 1984, from 3.02 times in 1983, primarily the result of improved net income. Gross interest charges increased 9.6 percent. The improvement in the overall financial position of many utilities was reflected in the bond rating changes issued by Moody's Investor Service in 1984. Moody's raised the ratings on the senior debt issues of electric utilities 38 times in 1984 and lowered ratings 25 times.

However, common stock dividends declined on a per share basis to $2.04 in 1984, from $2.05 in 1983. Severe financial difficulties experienced by a number of companies resulted in dividend omissions or reductions in 1984 of approximately $530 million and a reduction in the industry's payout ratio to 65.3 percent from 69.3 percent in 1983. Excluding those companies from our sample, however, dividends per share increased 5.0 percent in 1984, a growth rate which is somewhat more indicative of the

Table 1

Investor-Owned Electric Utility Industry Statement of Income
For periods ending December 31, 1984 and 1983 (Unaudited) (Millions of Dollars)

	Quarter Ending December 31,			Year Ending December 31,		
	1984	1983	% Change	1984	1983	% Change
Total Electric Operating Revenues	$29,065	$26,782	8.5	$119,479	$109,446	9.2
Electric Operating Expenses						
Fuel	$8,942	$8,711	2.7	$37,498	$36,174	3.7
Other Operation & Maintenance	8,086	6,988	15.7	29,980	26,718	12.2
Depreciation & Amortization	2,407	2,142	12.4	9,229	8,370	10.3
Taxes Other Than Income Taxes	2,037	1,926	5.8	8,537	7,790	9.6
Income Taxes (Federal & Other)	826	683	20.9	4,486	3,411	31.5
Provision for Deferred Income Taxes	1,472	1,382	6.5	4,926	4,494	9.6
Investment Tax Credit Adjustment, Net	(27)	35	n.m.	1,980	1,828	8.3
Total Electric Operating Expenses	$23,743	$21,867	8.6	$96,636	$88,785	8.8
Electric Operating Income	$5,322	$4,915	8.3	$22,843	$20,661	10.6
Other Utility Operating Income	299	302	(1.0)	1,482	1,087	36.3
Total Utility Operating Income	$5,621	$5,217	7.7	$24,325	$21,748	11.8
Other Income	526	454	15.9	2,079	1,736	19.8
Allowance for Other Funds Used During Construction	1,356	1,313	3.3	5,225	4,980	4.9
Total Income Before Interest Charges	$7,503	$6,984	7.4	$31,629	$28,464	11.1
Interest Charges						
Interest on Long Term Debt	$3,617	$3,223	12.2	$13,789	$12,430	10.9
Other Interest Expenses & Charges	275	296	(7.1)	1,180	1,229	(4.0)
Allowance for Borrowed Funds Used During Construction	(775)	(789)	(1.8)	(3,247)	(3,009)	7.9
Net Interest Expenses & Charges	$3,117	$2,730	14.2	$11,722	$10,650	10.1
Net Income Before Extraordinary Items	$4,386	$4,254	3.1	$19,907	$17,814	11.7
Extraordinary Items	(54)	(204)	(73.5)	(16)	(228)	(93.0)
Net Income	$4,332	$4,050	7.0	$19,891	$17,586	13.1
Preferred Dividends Declared	733	715	2.5	2,920	2,715	7.6
Net Income Available for Common	$3,599	$3,335	7.9	$16,971	$14,871	14.1
Common Dividends Declared	2,917	2,670	9.3	11,089	10,306	7.6
Additions to Retained Earnings	$682	$665	2.6	$5,882	$4,565	28.8
Avg. Shares Outstanding	5,557	5,134	8.2	$5,425	$5,025	8.0
Earnings Per Share*	$0.65	$0.65	0.0	$3.13	$2.96	5.7
Common Dividends Per Share*	$0.52	$0.52	0.0	$2.04	$2.05	(0.5)

*Based on average shares outstanding as reported to EEI by survey respondents and adjusted for stock splits.
NOTE: Revenues are adjusted for intra industry sales for resale of electricity.
n.m. = not meaningful

REVIEWS

Table 2

Investor-Owned Electric Utility Industry Balance Sheet
As of December 31, 1984 and 1983 (Unaudited) (Millions of Dollars)

Assets	1984	1983	% Change
Utility Plant*			
Utility Plant (Including Nuclear Fuel)	$309,676	$279,459	10.8
Less Accumulated Depreciation	89,066	80,828	10.2
Total	$220,610	$198,631	11.1
Construction Work in Progress	95,491	93,619	2.0
Net Utility Plant	$316,101	$292,250	8.2
Investments	9,425	8,367	12.6
Current Assets	38,268	33,196	15.3
Deferred Debits	18,020	12,001	50.2
Total Assets	$381,814	$345,814	10.4
Capitalization & Liabilities			
Capitalization			
Common Stock	$81,406	$76,322	6.7
Retained Earnings	41,251	35,369	16.6
Preferred Stock	30,367	29,479	3.0
Long-Term Debt	144,344	132,278	9.1
Total Capitalization	$297,368	$273,448	8.7
Current Liabilities			
Short-Term Debt	$5,464	$5,050	8.2
Long-Term Debt Due Currently	3,638	4,013	(9.3)
Other Current Liabilities	27,815	24,835	12.0
Total Current Liabilities	$36,917	$33,898	8.9
Deferred Credits			
Accumulated Deferred Income Taxes	$25,164	$21,075	19.4
Accumulated Deferred Investment Tax Credits	14,097	12,059	16.9
Other Deferred Credits	8,268	5,334	55.0
Total Deferred Credits	$47,529	$38,468	23.6
Total Capitalization & Liabilities	$381,814	$345,814	10.4

*Includes other utility plant of combination gas and electric companies.

portion of the industry paying dividends.

The industry's balance sheet showed marked improvement at the close of 1984 compared to the close of 1983. Several factors held the growth of construction work in progress (CWIP) to 2.0 percent between year-end 1983 and year-end 1984. Construction expenditures, including AFUDC, nuclear fuel, and other utility plant declined slightly in 1984 to $36.2 billion from $36.4 billion in 1983. In addition, the placing in service of some major new generating stations and units resulted in a decrease in the ratio of CWIP to net plant in service from 47.1 percent at the end of 1983, to 43.3 percent at the end of 1984. The accounting treatment, however, of at least one major project of almost $5 billion contributed to the decrease and was also the primary reason for the 50 percent increase in deferred debits.

A number of factors contributed to lower financing requirements in 1984. The slight decline in total construction expenditures, of course, was one factor. However, an even greater factor was the improvement in internal funds generation. During 1984, investor-owned electric utilities generated an estimated 50 percent of net construction expenditures, up from 44 percent in 1983. As a result, new offerings by investor-owned electric utilities declined 14.1 percent in 1984, to $10.2 billion, according to EBASCO Business Consulting Company. In addition to the new offerings, capital provided by such common stock plans as dividend reinvestments, employee stock options, and customer stock purchases provided an estimated $3.5 billion. All of these elements, as well as additions to retained earnings from operations and other long-term liabilities, contributed to an 8.7 percent increase in total capitalization. Long-term debt increased slightly to 48.5 percent of total capitalization from 48.4 percent at the end of 1983. Preferred stock declined to 10.2 percent from 10.8 percent in 1983.

Tables 1 and 2 are based on unaudited reports submitted by a sample of electric utilities. These utilities account for approximately 92 percent of the industry's revenues from sales to ultimate customers and total assets. The data were expanded to represent the entire investor-owned electric utility industry. Data for 1983, with the exception of the fourth quarter of 1983 income statement data, were obtained from the *Statistical Yearbook of the Electric Utility Industry/1983* (Edison Electric Institute publication number 04-84-15).

Contributed by the Finance Department of Edison Electric Institute.

TECHNOLOGY REVIEW

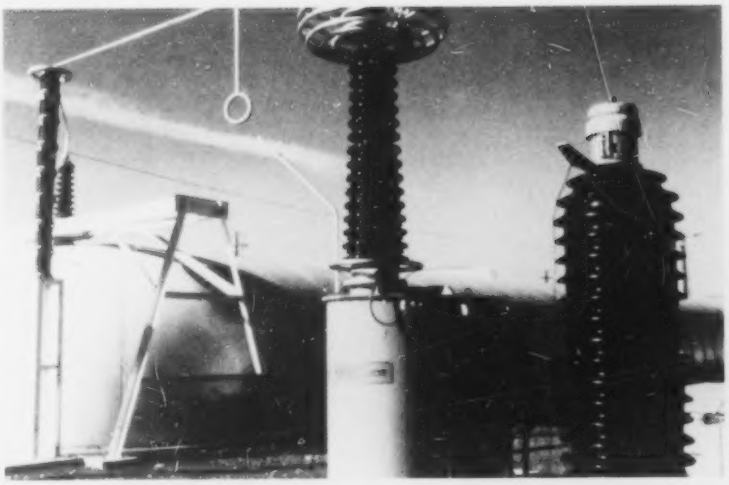
BIOLOGICAL EFFECTS OF ELECTROMAGNETIC FIELDS—RESEARCH UPDATE

The health effects of chronic exposure to electric fields, if they exist, appear to be very limited. That is the conclusion reached by scientists at the Electric Power Research Institute (EPRI) after eight years of study and more than $15 million in expenditures.

Results of part of this work will be published by EPRI later this year on a project known as Biological Effects of Electromagnetic Fields (BEEF). The project found that exposure to severe levels of electric fields—levels perceptible to experimental animals—do not produce significant effects.

The study investigated the effects of electric fields on Hanford miniature swine and on rats. Although exposed and control swine showed occasional significant differences, researchers did not see a consistent increase in birth defects. They occurred in some breedings, but not in others. The study was repeated in rats and the results were again weak and inconsistent. Teratologists—scientists who study birth defects—analyzed the data and were unwilling to accept results as demonstrating a significant effect.

"An effect was suggested in the first studies, but factors



Swine housed in shed were exposed to electromagnetic fields generated by high-voltage equipment.

Electric Power Research Institute

such as location of animal cages in the room, microcurrents or microshocks during drinking, and random variation cannot be ruled out as causative factors," reported EPRI project manager Robert M. Patterson, a member of the Institute's Health Studies Program. "Other studies involving more extreme conditions have also failed to produce an effect."

This situation has prompted EPRI to pursue studies to look for consistent effects beyond statistical noise. The additional studies, which will get under way at two laboratories later this year, will use larger groups of animals, as well as several electric field strengths—both lower and higher than those used in the previous studies.

In the BEEF study, a generation of female rats was exposed to an effective field of 65 kilovolts per meter (kv/m) for 20 hours per day for four weeks. This exposure produced body currents in the rats nearly equivalent to those a person would likely encounter standing under a 765kv line (10kv/m). The animals were then bred with unexposed males. The pregnant females were sacrificed at 20 days and their fetuses examined. Of the 22 litters from exposed rats sacrificed, one showed a malformed fetus. Litters from the 21 control rats sacrificed showed no malformations.

The results were statistically indistinguishable.

Other rats from each group were allowed to bear young to produce a second generation. These females were kept in the electric field and rebred at about seven months with a different group of unexposed males. The animals were sacrificed at 20 days for a second experiment. While there were more malformed fetuses in the exposed than in the sham-exposed group, the results again were not significantly different. Fetal examinations of the third and final teratology showed significantly more malformations, by litter, in the exposed than in the sham groups. The study was repeated again with no significant differences seen between the exposed and control groups.

It is possible that these results reveal a small, but real difference in response between exposed and unexposed rats and swine. This could occur if the field strengths used were at the lower limit of a threshold.

"Keep in mind that with any study of possible hazards, no amount of experimental effort can ever demonstrate there are no effects from electric fields. Science can rarely prove safety. There is always the possibility that just one more experiment will uncover something," explained Patterson. "The results of our upcoming studies can be weighed with those of previous studies to contribute to the consensus of whether electric fields are teratologic or not."

In addition to the swine and rat study, EPRI will also publish final reports this year on four other projects in the field. EPRI research into electric field effects on honey bees and on plants and chicken embryos, as well as the biological effects of small air ions, will be covered. Projects extending beyond 1985 will include studies of AC field exposure and will compare electric field exposure monitoring instrumentation.

Meanwhile, EPRI is one of two U.S. organizations funding epidemiologic research into the possibility of health effects from exposure to electromagnetic fields (EMF). The American Telephone and Telegraph Company (AT&T) is providing EPRI researchers with the records of 400 workers from among more than one million employees who have been diagnosed as having leukemia in recent years. The study is designed to find out whether persons with leukemia were more exposed to EMF on their jobs than a control group without leukemia. Utility linemen jobs are of special interest because they may involve working near power lines.

AT&T was chosen to assist EPRI in its investigation of leukemia risk because the company has kept extensive and thorough employee health records. Also, AT&T wanted to assist with the research. The Johns Hopkins School of Hygiene and Public Health is the contractor.

The other organization managing two epidemiology projects is the New York State Department of Health through its Power Lines Project, which is sponsored by New York utilities. The Seattle Cancer Registry and the University of Colorado are doing the work. The Seattle project seeks to determine if incidence of leukemia among adults exposed to EMF in their homes is greater than adults in a non-exposed control group. The Colorado study will determine if exposure to measured EMF within the homes of school-age children with cancer is greater than that experienced by a comparison group of their classmates.

These projects were undertaken to provide better information to answer questions raised by the 1979 Wertheimer-Leeper report alleging a cancer risk from EMF exposure. Conducted in the Denver area, it reported an increase in cancer among children living near what investigators refer to as "high current configurations." Other investigators, with a similar study design in Rhode Island, did not confirm this finding.

Investigators here and abroad have conducted other studies on adults possibly exposed to EMF in the workplace. Occupations included electricians, welders, linemen, and power station operators. The diseases included leukemias—not always of the same kind—and brain tumors. The diversity of findings is perplexing, and further research is needed, say EPRI researchers.

Interpretation of study results is complicated by the lack of solid information on exposure levels, both in the groups suspected of being exposed to EMF and in the general population. EPRI is attempting to remedy this by funding work to design instruments that can collect exposure data, and by developing a methodology to provide estimates of annual exposures of designated groups.

Leonard Sagan, senior scientific advisor in EPRI's Energy Analysis & Environment Division, commented, "We are not saying there is no relationship between EMF and cancer. We do not know whether these prior studies demonstrate a connection or whether these are pure chance relationships. It's our responsibility to understand better whether there is a relationship between electric fields and health effects, though the evidence of causation so far is not persuasive." There is neither theory nor a body of animal data that would support a cancer-promoting effect of EMF, he added.

"As a matter of environmental health, the effects on humans exposed to EMF deserve EPRI attention, and projects are underway to provide better answers. But, most knowledgeable observers conclude there is insufficient evidence to justify mitigating or remedial steps," he said. EP

Contributed by the Public Information Department of the Electric Power Research Institute.

REVIEWS

STATISTICAL REVIEW

1984 SALES UP

Sales of electricity to ultimate customers by investor-owned electric utilities totaled 1.736 billion megawatt hours (mwh) in 1984, up 5.8 percent from 1.640 billion mwh in 1983. (See Table 1.)

The primary force behind the growth was the growth in the nation's economy. During 1984, the Federal Reserve Board Index of Production (less the electricity component) increased 10.7 percent, compared to a 6.5 percent increase in 1983. In response to the growth in industrial activity, sales of electricity to industrial customers increased 7.8 percent in 1984, accounting for almost half of the total electricity sales growth for the year. However, the rate of growth in sales to industrial customers slowed in each successive quarter during 1984.

Sales to residential customers increased 3.2 percent in 1984, the greatest percentage annual increase since 1980. (See Table 2.) Colder than normal winter temperatures and a 1.8 percent increase in the number of ultimate residential customers created the majority of the increase. Sales to commercial customers increased 6.1 percent, and the number of commercial customers grew 2.4 percent.

Total net generation by the total electric utility industry increased 4.5 percent in 1984 to 2.413 billion mwh. Additional sources of electricity experienced even greater increases. Net imports increased 9.9 percent to 39.3 million mwh, and purchases from industrial sources increased 17.8 percent to 15.0 million mwh.

Table 1

Electricity Sales and Economic Activity, 1983 to 1984 (Percent Change)

	First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Year
Change in Sales to Industrial Customers	12.8	10.9	5.6	2.7	7.8
Federal Reserve Board Index of Production	15.4	12.9	9.1	6.1	10.7
Change in Sales to Total Ultimate Customers	11.5	8.7	1.3	3.0	5.8

Table 2

1984 Customer and Sales Data, Investor-Owner Electric Utilities

	Twelve Months Ended December 31, 1984	1983	% Increase
Number of Customers			
Residential	66,326,642	65,147,198	1.8
Commercial	7,998,038	7,809,824	2.4
Industrial	397,060	387,570	2.4
Street & Highway	112,298	114,608	(2.0)
Other Public Auth.	138,676	137,647	0.7
Railroads	24	23	4.3
Interdepartmental	460	472	(2.5)
Total Customers	74,973,198	73,597,342	1.9
Electricity Sales (mwh)			
Residential	563,334,705	546,114,622	3.2
Commercial	473,209,995	446,037,128	6.1
Industrial	643,432,620	596,739,365	7.8
Street & Highway	10,148,950	10,449,208	(2.9)
Other Public Auth.	40,997,850	36,412,645	12.6
Railroads	2,055,413	1,929,257	6.5
Interdepartmental	3,171,950	2,817,046	12.6
Total Sales (mwh)	1,736,351,483	1,640,499,271	5.8

Contributed by the Finance Department of Edison Electric Institute.

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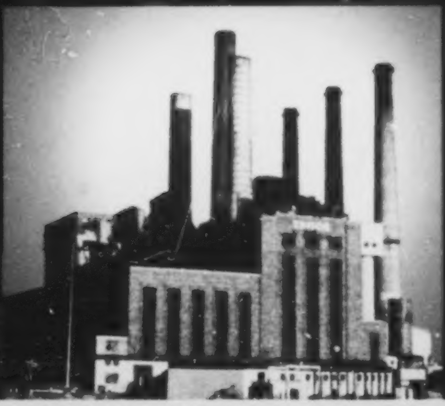

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Finding ways to keep aging power plants operating reliably and efficiently into the 21st century is becoming a reality through several pioneering Life Extension Programs, such as one for Boston Edison Company's Mystic Unit 6. When the final reports are in for the Electric Power Research Institute projects, the bottom line for the industry will be written, proven guidelines for developing individual life extension programs.

Boston Edison's interest in operating its 25-year-old Mystic Unit 6 until 2010 and beyond is based on a goal shared by many—finding the most economical way to serve customers. As project manager and AE for the Mystic 6 effort, Sargent & Lundy is helping Boston Edison and the industry meet this goal.

During the Mystic 6 research program, the project team performed and evaluated more then 5000 tests to determine which component upgrades are necessary for life extension study. The final Mystic 6 report will include a complete plan for developing a program from economical evaluation of upgrades and schedules for capital improvement to recommendations for inspection intervals diagnostic monitoring, and operating procedures.

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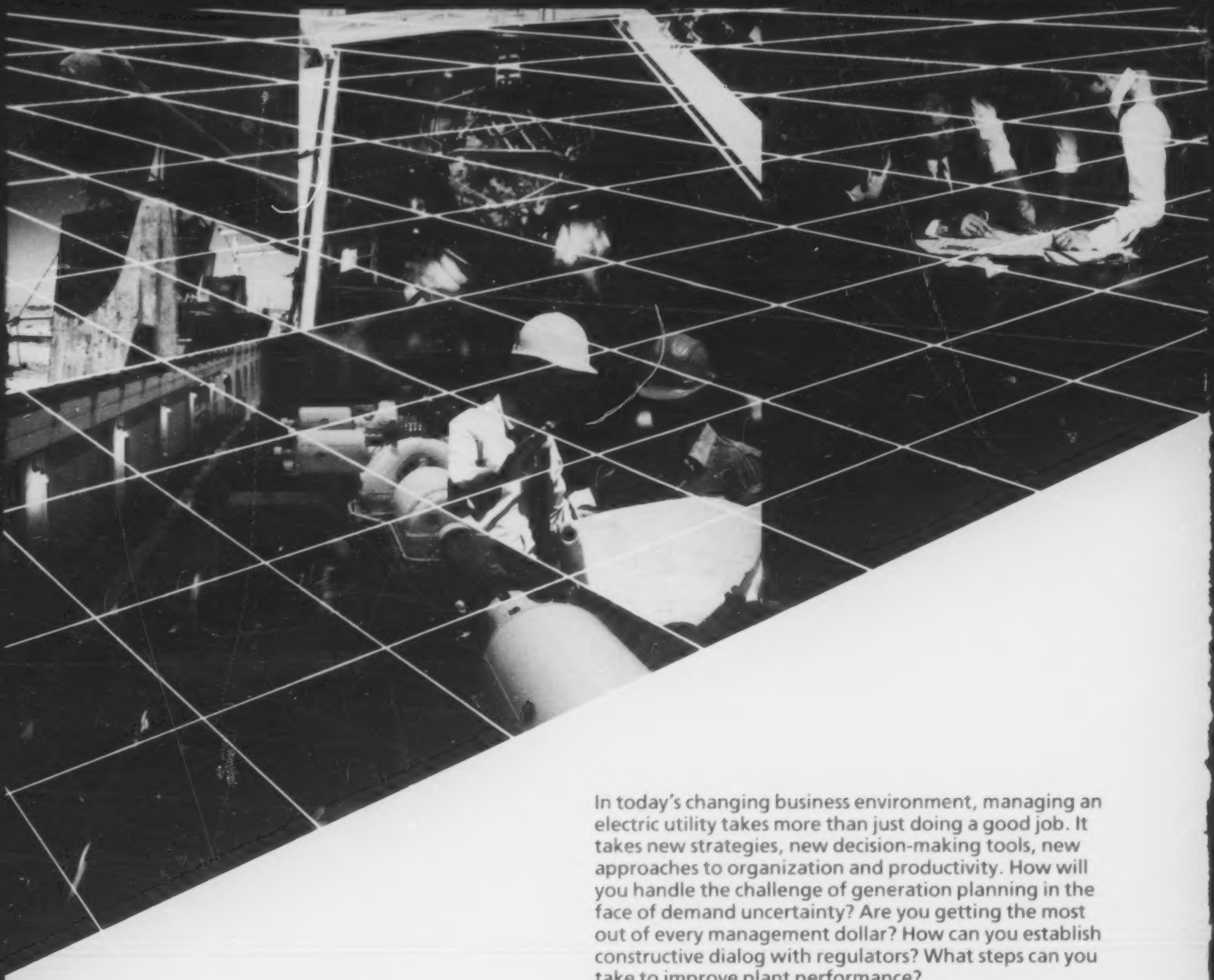

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A PERIODIC REPORT FROM BURNS AND ROE, INC.

FALL 1985

Burns and Roe announces three key appointments

Burns and Roe has appointed **K. Keith Roe,** formerly president of Burns and Roe, Inc., president of Burns and Roe Enterprises, Inc., parent corporation for the Burns and Roe family of companies. He succeeds **Kenneth A. Roe,** who continues as board chairman and CEO.

Succeeding Keith Roe as president of Burns and Roe, Inc., is **Warren R. Cobean, Jr.,** formerly executive vice president.

E. Richard Kummerle, formerly vice president of Engineering Technology Division of Burns and Roe, Inc., appointed president of newly formed Engineering and Construction Services Division of Burns and Roe Enterprises.

Other appointments

Richard L. LeFebvre now general manager of Burns and Roe Construction Group. **J. Alan Forrest** now responsible for fossil power plant projects, and **Henry E. Bartoli** for fossil plant services. **Ashraf T. Dajani** now has responsibility for nuclear power projects plus project finance and development. **Tom W. DiFransico** now responsible for nuclear plant services. **S.C. "Andy" Marathe** is chief electrical engineer; **R. Gene Baggs** is assistant chief electrical engineer. **Jeffrey T. Whipple** is chief mechanical engineer; **Raymond M. Costello** is assistant chief mechanical engineer. **Morton H. Rothstein** is assistant chief civil engineer. **Thomas J. Jhun** now manager in the International Operations Division, with responsibility for activities in Far East Region. **Donald R. Becan** is now regional manager in Power Engineering Services Division. **Lewis C. Jeffrey** elected treasurer, and **Roger A. Fasnacht** has joined company as controller.

Kenneth A. Roe
Chairman and CEO
Burns and Roe
Enterprises, Inc.

K. Keith Roe
President
Burns and Roe
Enterprises, Inc.

W.R. Cobean, Jr.
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Current and recent Burns and Roe projects

Following is a partial list of current and recent Burns and Roe projects involving nuclear and fossil plants, power technology projects, and overseas projects.

Nuclear plant services

GPU Nuclear Corporation's Oyster Creek Nuclear Generating Station: projects involving urgrading of fire protection, and evaluation of structural conditions, material performance and equipment conditions of plant intake structure. **GPU**'s Three Mile Island Unit 1: projects involving addition of a safety features ventilation system for fuel handling building, and for addition of a reactor coolant inventory tracking system. **Southern California Edison**'s San Onofre Nuclear Station Units 1, 2 and 3: provision of operational schematics. **TVA**'s Browns Ferry Nuclear Plant: preparation of instrument setpoint calibration calculations.

Nuclear plant projects

U.S. Department of Energy: studies on large-scale prototype breeder reactors and on breeder reactor technology transfer; also serving as DOE's consultant on Shippingport decommissioning. **Teledyne Industries:** engineering study for decommissioning of NASA-owned Plum Brook nuclear reactor.

Fossil plant projects

Central Hudson Gas & Electric: reconversion of Danskammer Units 3 and 4 from oil-fired to coal.

Fossil plant services

Big Rivers Electric Corp.: continuing engineering services at D.B. Wilson Station. **Central Illinois Light Co.:** design review of Duck Creek Unit 1 boiler. **City of Jamestown, NY:** controls upgrade at Carlson Station.

Power technology projects

Electric Power Research Institute: studies involving oxygen control methods for pressurized water reactor secondary systems; development of utility data base on fabric filter installations; and evaluation of utility oil-fired boilers for conversion to coal/water fuels. **Chugach Electric**: studies on optimization of gas storage methods and energy utilization alternatives. **Public Service Electric & Gas**: study of repowering of existing steam units using combustion turbines. **City of Jamestown, NY**: design and construction of hot-water-based district heating system. **Babcock & Wilcox**: study of conversion of Consolidated Edison's Astoria Unit 10 to fluidized bed combustion.

Overseas projects

Korea: completion of three-year conversion of two 300MW oil-fired units to coal at Honam. Consulting services continue on 500MW coal-fired standardization program, and on two new nuclear plants in the 900MW range. **Taiwan:** conversion and retrofit of 350MW oil-fired unit to coal. **Australia:** engineering and design on two 300MW coal fired units in Western Australia. **People's Republic of China:** completion of feasibility study on two 900MW nuclear units in Fujian Province.

The Philippines: completion (as subcontractor to Westinghouse) of engineering work on Philippine Nuclear Power Plant No. 1, a 650MW unit. **Japan:** continuing project assignments for Mitsubishi on Japanese Demonstration Fast Breeder Reactor project.

Thailand: feasibility study of fluidized bed combustion using low-grade lignite. **Hong Kong:** an assessment of T&D system. **Dominican Republic:** plant design upgrade of six fossil-fired plants.

Southeast Regional Headquarters relocated

Burns and Roe's Southeast Regional headquarters has relocated from Jacksonville to 7800 Southland Blvd., Orlando, Florida 32809.

J.J. Byrnes, vice president, is in charge of the Orlando office.

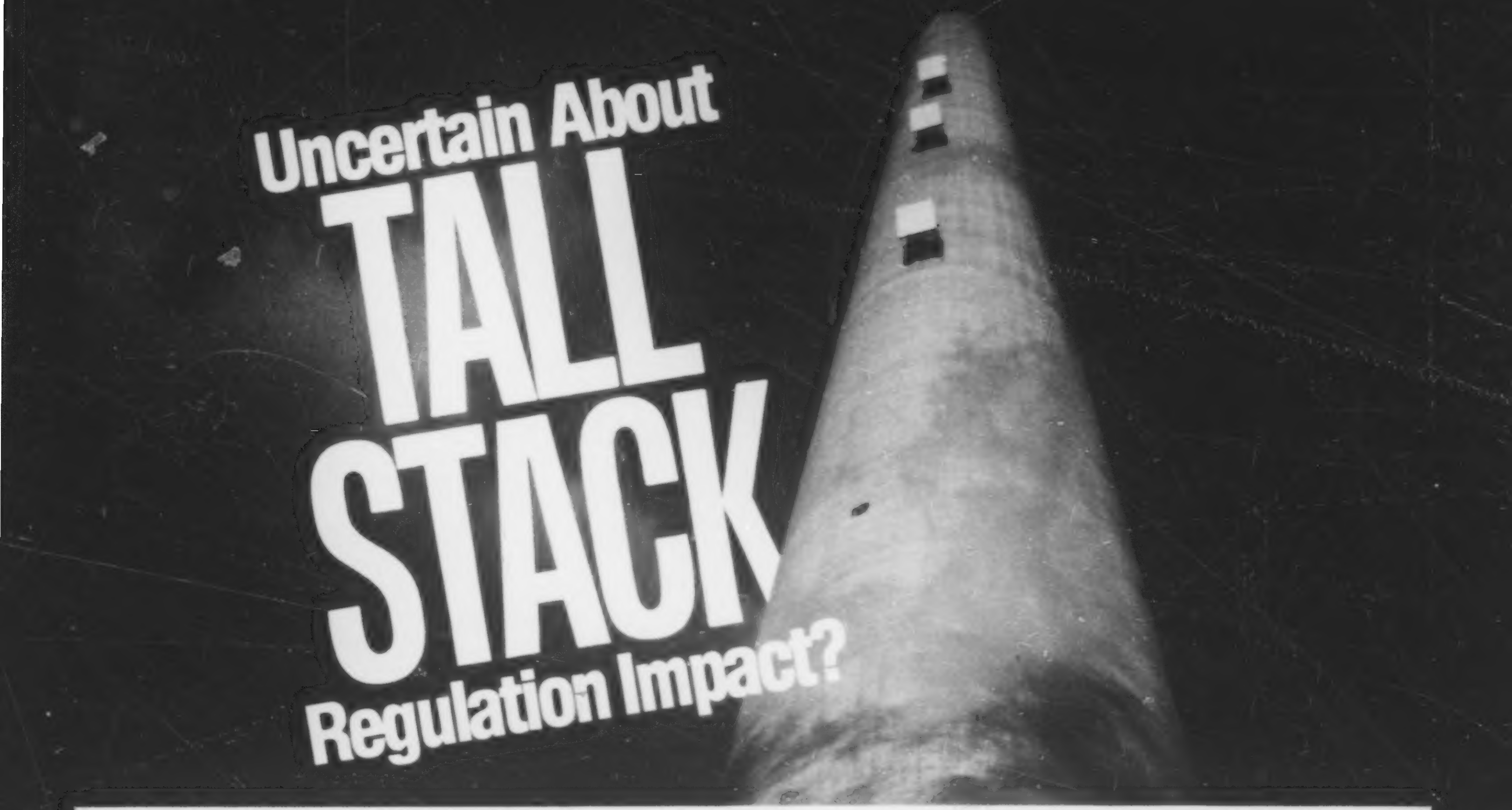
The relocation was undertaken to provide better service to Burns and Roe's utility clients in Southeast.

New TOPS brochure

A four-page, full-color brochure featuring Burns and Roe's new Thermal On-line Performance System (TOPS) is available upon request.

TOPS is a computerized operating tool for use in fossil-fired power plants. It monitors all plant components – up to 150 signals, including flow, pressure and temperature – to develop comprehensive data on the plant's efficiency. Using these data, TOPS calculates the efficiency levels of the plant and its major components.

For a copy of the TOPS brochure, call **Bus Cobean** at (201) 265-2000 or write him at Burns and Roe, 800 Kinderkamack Road, Oradell, NJ 07649.



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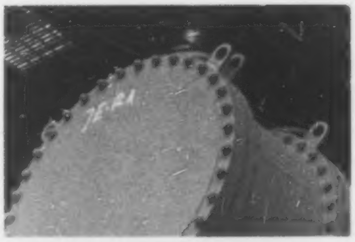

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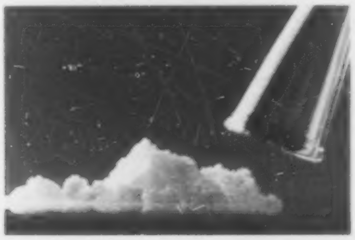

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Leslie Braunstein

Clean Coal Technology: Just in Time

If federal help comes now, the commercialization of clean coal technology can give electric utilities, the environment, and the economy a big boost.

Clean coal technology can make a big difference in how America's power plants do their job.

Coal combustion methods, which have changed little since the introduction of pulverized coal boilers in the 1920s, are now being adapted to meet today's environmental, economic, and financial realities. From coast to coast, electric utilities are on the brink of commercializing new technologies that have been looking good in the research and development stage.

The new technologies range from the basic, such as improved coal cleaning, to the exotic, such as magnetohydrodynamics. The humble lump of coal is being crushed, ground, sifted, dewatered, pulverized, micronized, pressurized, and desulfurized. It is being subjected to microwaves and magnetism, tossed around in a "fluidized bed," and transformed into a clean-burning gas.

As a result of such high-tech manipulation, coal can be burned more cleanly than ever—with 90 to 99 percent of its potentially polluting sulfur content removed. In addition to this environmental benefit, clean coal technology offers numerous other advantages over conventional combustion and pollution control methods: less solid waste, less overall cost, shorter construction time, reduced power plant financing charges, improved efficiency, and the ability to use a wider range of fuels.

Clean coal technology is entering the scene at a crucial time. Electric utilities, which have been minimizing construction during the last decade, must begin building new power plants to avoid possible brownouts and blackouts near the turn of the century. Since nuclear power plants have become too costly and problematical, coal has emerged as the only reliable domestic fuel for baseload power plants. "Electric utilities need to demonstrate new technologies as expeditiously as possible in order to have them commercially available during the middle part of the 1990s," said Thomas R. Kuhn, executive vice president of the Edison Electric Institute (EEI).

To demonstrate new technologies in a regulated, "risk-adverse" industry, however, federal support is needed, Kuhn pointed out. "As a regulated industry, utilities do not have the flexibility to compensate for the financial risk of new technology demonstrations in a manner similar to other private sector industries," he said.

Commented Jack H. Ferguson, president and chief operating officer of Virginia Power, "Without federal support, we could easily have a situation in which utilities will not embrace, and their regulators will not permit, new technology until it is demonstrated by another company. . . . While this may be a prudent approach for each utility and its regulators, it will not be in the best interest of the nation."

Indicating its confidence in clean coal technology's future, the electric utility industry already has invested hundreds of millions of dollars in research and demonstration programs, independently and through contributions to the Electric Power Research Institute (EPRI). And the efforts are beginning to pay off. Successful demonstration of new technologies is causing excitement throughout the industry.

Fueling this excitement is the success of the Cool Water coal gasification demonstration plant in California's Mojave Desert. Since the summer of 1984, the 120-megawatt (MW) power plant has been converting 1,000 tons of coal per day into a clean synthetic gas, which has been used to provide electric power for about 100,000 households. It was built in just under 29 months—about one-third the time it takes to build a conventional coal-fired power plant. Its emissions have averaged one-tenth of permissible levels, leading sponsors to call Cool Water "the world's cleanest coal plant."

Cool Water's equity owners are Texaco Inc., Southern California Edison Company, EPRI, Bechtel Power Corporation, General Electric Company, and the Japan Cool Water Program Partnership. The Empire State Electric Energy Research Corporation (ESEERCO) and Standard Oil Company of Ohio contributed additional funding, and the Synthetic Fuels Corporation is providing price supports

Leslie Braunstein is a writer and communications consultant specializing in energy and economic issues.

Electric Power Research Institute

Heat exchangers and process columns are critical to the success story at the Cool Water coal gasification demonstration plant.

Southern California Edison Company

"The world's cleanest coal plant"—the California IGCC project was built so quickly and has reduced emissions so remarkably that excitement is rippling throughout the electric utility industry.

during the plant's first five years of operation. After the demonstration ends in June 1989, Southern California Edison may buy the facility.

Welcoming the good news from California, other utilities are now exploring the prospects of coal gasification. For example, the Potomac Electric Power Company (PEPCO) is considering the construction of a 360-MW commercial plant using the Cool Water integrated gasification combined cycle (IGCC) technology, which could be brought on line in three phases beginning in 1995. Two 108-MW combustion turbines would be scheduled to begin service in 1995 and 1996 respectively, to be augmented by a coal gasifier and heat recovery generators providing 144 MW of power beginning in 1997. "PEPCO's tentative plans have been influenced by the success of the Cool Water project," said company spokesman Tom Welle, adding that many of the 35 member utilities of the Utility Coal Gasification Association are contemplating building IGCC plants in the 1990s.

Another clean coal technology showing near-term commercial promise is fluidized bed combustion. Encouraging results at the Tennessee Valley Authority's (TVA) 20-MW pilot plant near Paducah, Kentucky, have helped spur interest in this environmentally advantageous method of using coal. Participating along with TVA in the test program are EPRI, Duke Power Company, the State of Kentucky, and Babcock & Wilcox which designed and built the boiler and associated equipment with aid from Stone & Webster.

Successful operation of the pilot plant since 1982, highlighted by up to 95 percent sulfur removal (depending on the type of coal and other factors), has led the sponsors to proceed to a larger, commercial-scale demonstration. A 160-MW unit, with the boiler to be built by Combustion Engineering, is slated to begin operating in 1988. After a four-year test program, it should begin full commercial operation in 1993.

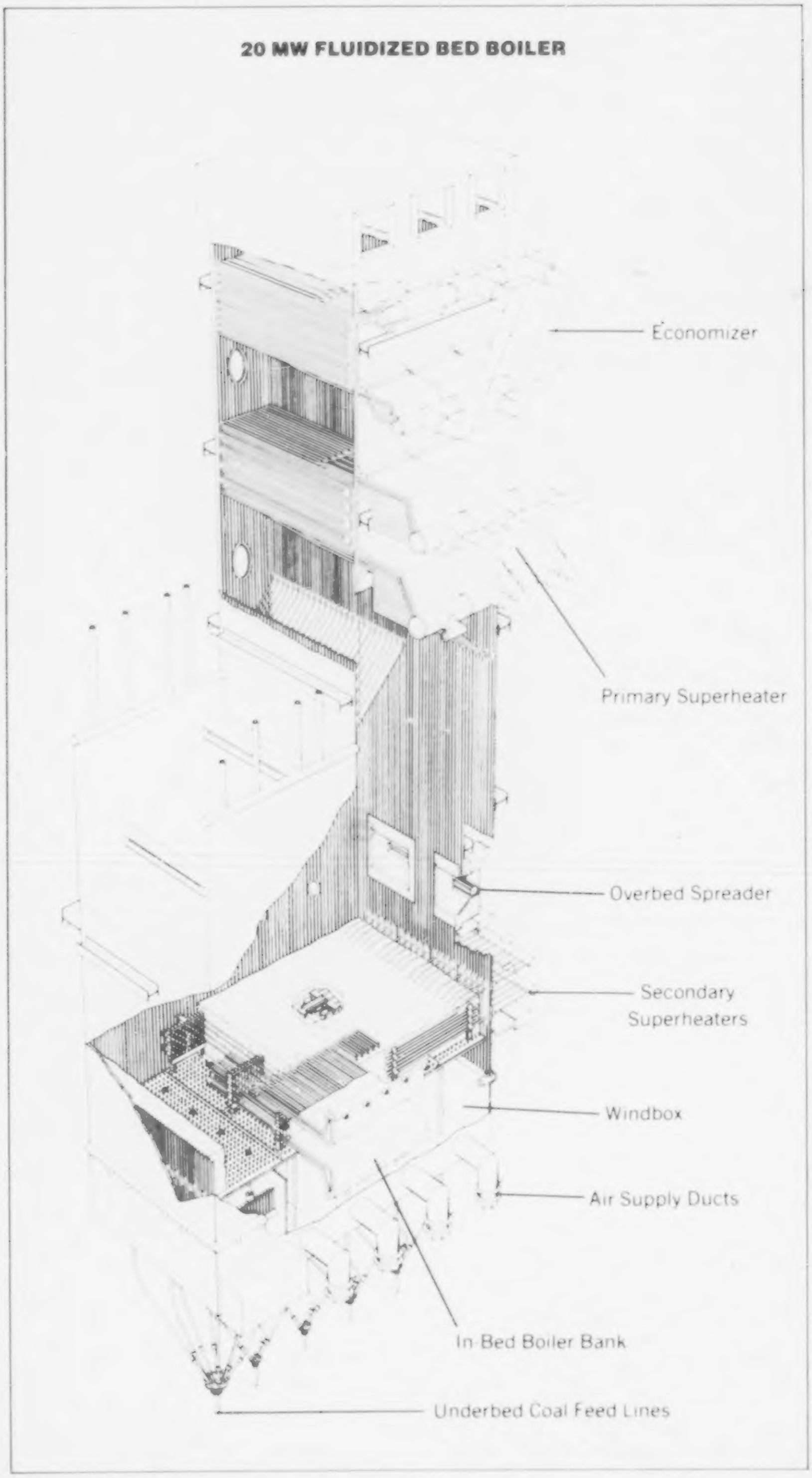
Although the integrated gasification combined cycle process and fluidized bed combustion are considered "front-runners" for new power generation, they are but two of a wide variety of clean coal technologies being developed by both industry and government. Different technologies will be required to meet the diverse needs of utilities. Some of the most promising technologies are still in the early stages of development.

Many major ongoing coal research programs began some time ago, during the 1960s, in response to concern about the environmental effects of coal combustion. That concern remains an important issue today, as the nation turns to coal for an increasing share of its energy needs.

Clean Coal and the Environment

Emerging coal technologies are designed to comply with environmental regulations in a cost-effective manner. The Clean Air Act, enacted originally in 1963 and amended in both 1970 and 1977, seeks to control the release of sulfur dioxide, nitrogen oxides (NOx), and particulates from coal-burning power plants. The Environmental Protection Agency's (EPA) New Source Performance Standards, first issued in 1971 and revised in 1978, require new power plants to remove 70 to 90 percent of the sulfur oxide emissions from their flue gases. Proposed Clean Air Act amendments would require extensive modifications to older coal-burning power plants.

To date, the primary method for complying with existing environmental regulations has been installation of a flue gas desulfurization system known as a "scrubber." This technology has been effectively re-


20 MW FLUIDIZED BED BOILER

Babcock & Wilcox

Its boiler designed and built by Babcock & Wilcox, TVA's pilot plant for atmospheric fluidized bed combustion is getting dramatic results.

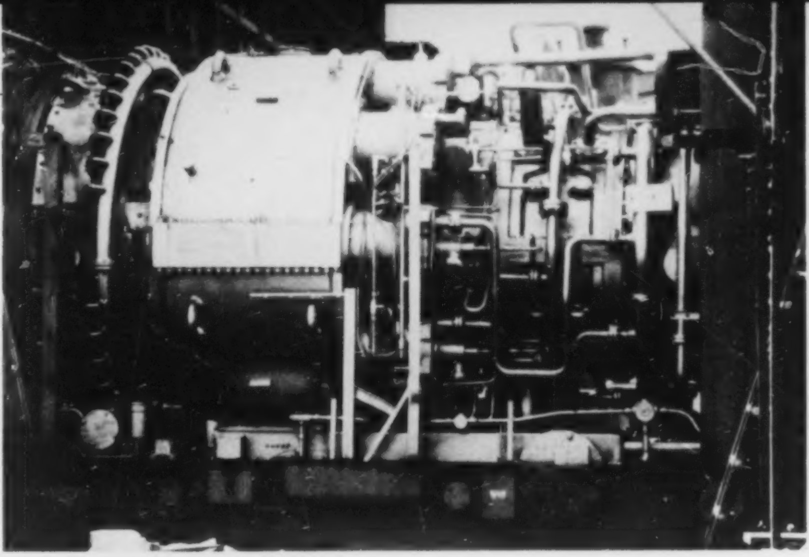
quired for all new pulverized coal-fired power plants since 1977.

"Scrubbers have proven to be among the most costly and least reliable pieces of equipment in the utility industry," said Richard E. Balzhiser, senior vice president for research and development at EPRI. He pointed out that the typical scrubbing system creates a tremendous amount of solid waste, can cost up to $100 million, uses huge amounts of water (more than 1,000 gallons per minute), and consumes 3 to 8 percent of the power plant's total energy output. In addition, it is subject to fouling and corrosion, and its maintenance cost is two to 20 times that of the rest of the power plant.

There are now about 120 scrubber-equipped generating units operating at U.S. utilities; more than 100 additional units are planned or under construction. Together with greater use of low-sulfur fuel, they have helped reduce air pollution in the United States considerably. According to EPA, total sulfur dioxide emissions dropped 28 percent throughout the country from 1973 to 1983. Emissions from electric power plants dropped 19 percent during that period, while power plant coal use increased by more than 60 percent. Despite these improvements in air pollution control, however, the acidity of rainfall in the Northeast has not changed appreciably in the last 15 years.

It is this conundrum that is fueling the current debate over proposed additional acid rain legislation. One side seeks further reductions in sulfur dioxide emissions; the other side argues that other factors also may contribute to the acid rain problem. "In essence, the debate has been reduced to an argument over which sources should be forced to further control sulfur dioxide emissions, by what means, and at whose expense," said Balzhiser. Utility industry planners see far greater promise in the commercialization of new coal-burning technology than in further construction of costly and complex scrubbing systems.

Research and demonstration programs have provided data showing both the short-term and long-range environmental benefits of new coal-burning technologies. As shown in Table 1, six new coal combustion technologies could control emissions as effectively or better than a conventional coal-fired power plant equipped with flue gas desulfurization. In the long term, as shown in Figure 1, the results may be even more dramatic. Retrofitting older power plants with new pollution control equipment would reduce emissions in the short term—between 1990 and 2010. At about that time, however, increasing demand for electricity would cause emissions to begin rising again, eventually returning to current levels. Alternatively, the introduction of new coal technology would cause sulfur dioxide emissions to begin dropping by the mid-1990s and to continue dropping steadily through the next three decades.


Electric Power Research Institute

A gas turbine powered by syngas works in combined cycle with a steam turbine to produce 120 MW of electricity at Cool Water.

New Coal Technology to Meet Growing Electricity Demand

In addition to offering long-term environmental advantages, clean coal technology appears to be one of the few practical options for meeting the nation's growing demand for electric power through the early part of the next century.

Federal government and industry forecasters have predicted that the demand for electric power will grow at an annual rate of 2 to 4 percent through the year 2000. "Even after considering the effects of conservation, load management techniques, and cogeneration, the electric utility industry, on a national average, is projecting an annual growth in consumption of 2.7 percent," said Kuhn. Figure 2 shows projected power demand with annual demand growth rates of 2.0 percent, 2.5 percent, and 4.0 percent. New capacity will be needed

Table 1

Pollution Control Potential of New Coal Technologies

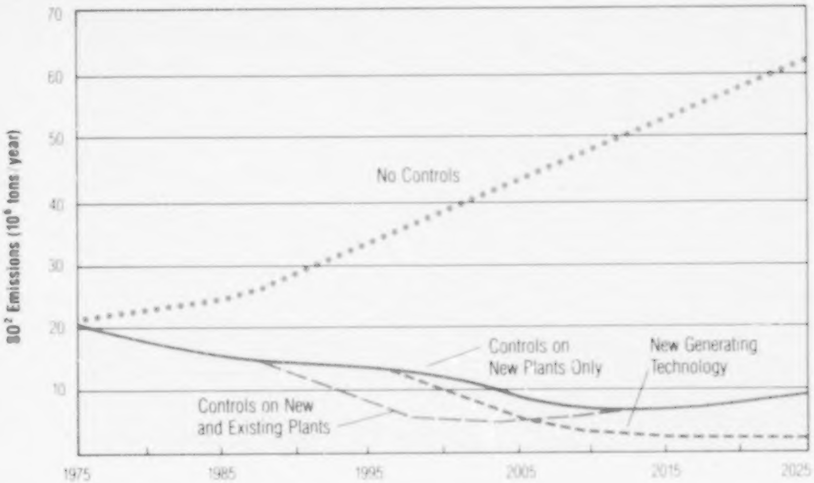
Technology	Sulfur oxide (percent removal)	Nitrogen oxide emissions (lb/10^6 Btu)	Particulate emissions (lb/10^6 Btu)
Conventional Pulverized Coal Technology with Flue Gas Desulfurization*	90-98	0.5-0.6	0.03
Atmospheric Fluidized Bed Combustion	90-95	0.2	0.01
Advanced Pulverized Coal/Flue Gas Desulfurization	90-95	0.2-0.3	0.01
Pressurized Fluidized Bed Combustion	90-95	0.1	0.01
Gasification Combined Cycle	90-99	0.1-0.3	0.003
Fuel Cell Gasification Combined Cycle	99+	0.003	nil
Limestone Injection with Staged Combustion/Baghouse or Precipitator (Slagging Combustor)	90-95	0.1	0.01

*EPA New Source Performance Standards
Source: Edison Electric Institute

not only to meet growing demand, but also to replace deteriorating power plants, displace high-cost fuels, and provide a reserve margin for reliability.

Figure 1

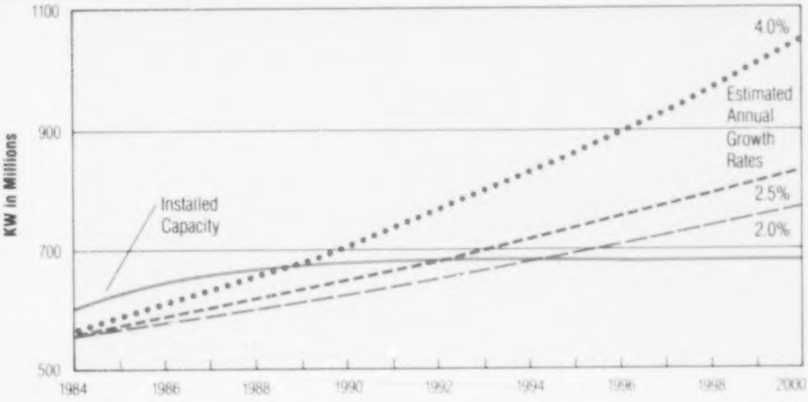
Utility Emission Trends, 1975-2025



Source: *EPRI Journal*. Electric Power Research Institute, November 1983, p. 50.

Figure 2

U.S. Electric Generating Capacity and Peak Demand, 1984-2000



Note: Peak demand at stated growth rates with 20% capacity margin needed for dependable supply. Includes existing capacity and capacity under construction less retirements of 15 million kilowatts through 1993 as reported to North American Electric Reliability Council (NERC).

Source: Report of the Edison Electric Institute, Feburary 1985, p. 19.

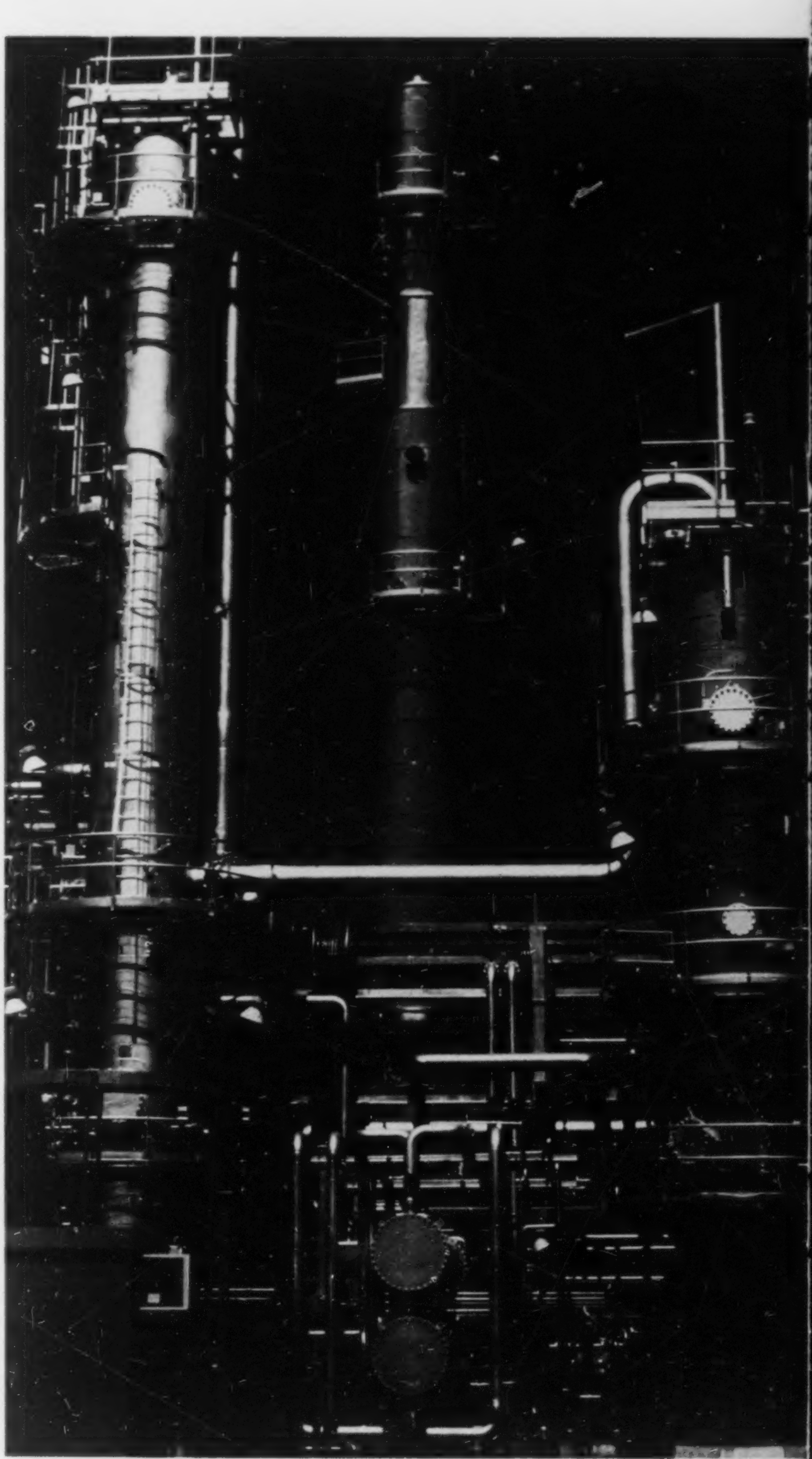
Utilities must plan now to add substantial amounts of new capacity in the 1990s—at least 10,000 MW each year after 1992, according to an EPRI calculation—because capacity margins are dropping, and electric power demand is expected to increase steadily even if overall economic growth rates are modest. A number of developments have contributed to this situation:

- Oil price hikes, conservation, and slowed demand growth rates during the 1970s left utilities with high capacity margins.
- Utilities adopted policies to minimize capacity margins and cancelled power plants. Now margins are dropping and may reach dangerously low levels in the next decade if current trends continue.
- The financial difficulty of completing nuclear power plant construction, exacerbated by the Three Mile Island incident, led to further plant cancellations.
- Even in periods of slow economic growth, the demand for electric power has been rising. In the decade following 1972, while U.S. energy use dropped by 5 percent and oil use dropped by 13 percent, energy devoted to electricity production rose by 22 percent. Presently accounting for about a third of the nation's energy use, electric power may provide half the nation's energy demand by the end of the century.

As shown in Table 2, EPRI projects a need for up to 420 gigawatts (GW) (1 gigawatt = 1,000 megawatts) of new electric generating capacity in the 1990s. About 131 GW are planned for service between 1985 and 1993. If electric power demand grows more than 3 percent annually, each percentage increase will translate to an annual additional new power generating requirement of 100 GW.

To meet the increasing electric power demand, coal will play a major role. The financial and regu-

The Cool Water demonstration plant removes up to 99 percent of sulfur oxide.



latory difficulty of building new nuclear power plants has virtually eclipsed that once-promising source of baseload power. No new nuclear plants have been ordered since 1978. The long-term price and supply of oil and natural gas remain too uncertain for planned baseload power use. Coal, which currently provides more than half the nation's electricity, may have to satisfy up to 70 percent of America's power demand as the century closes.

To demonstrate new technologies in a regulated, "risk-adverse" industry, federal support is needed, Kuhn pointed out.

The Need for Modular Power Plants

The electric utility industry's current financial situation is one of the major factors driving the need for new coal-based technology. During the 1960s and early 1970s, the industry thrived on growing demand for electricity, low inflation, low fuel cost, improvements in technical efficiency, and expanding economies of scale. Now, of course, the situation has been reversed. Utilities face high fuel cost, uncertain demand growth, higher inflation, and costly construction delays. "In some cases, the cost of adding a baseload generating plant can exceed the net worth of a company," notes EEI's Kuhn. "Frequently, construction is a threat to the financial standing of a company. Financial incentives are to forego construction if at all possible."

Table 2

Increased Need for Electric Power Capacity in the 1990s
(Annual electric power demand growth at 3%)

	Potential Capacity Needs Gigawatts (GW)
Electricity demand growth rate at 3%	190
Offset retirements or declining performance	60
Maintain gross peak reserve margin at 30%	80
Potential nuclear deferments or cancellations	40
Impact of possible acid rain legislation	20
Impact of possible oil cutoff	30
Total	420

Source: Electric Power Research Institute

"We are now in a slower growth, rising cost planning environment," Kuhn continued. The imperatives of this situation, aside from attempting to change the ways in which utilities are regulated and financed, include:

- building smaller baseload power plants,
- reducing construction lead times, and
- matching supply increments more closely with demand.

These needs are interrelated. Smaller power plants, simply by being smaller, could more easily keep pace with slow-growing demand and require less time to plan and build. Furthermore, plants which promise minimal adverse impact on the environment could receive rapid regulatory approval, avoiding costly construction delay. There is a possibility that power plants built in a modular fashion could be "eased" into the rate base, lessening "rate shock." Thus new power generation technologies have great potential for public acceptance, from both an environmental and an economic standpoint.

The New Technologies

With coal, there are opportunities for pollution control before, during, and after combustion. New technologies are being developed to attack the pollution problem at each of these three stages. In addition, there are combined and advanced systems under development, some of which avoid the combustion process altogether. The needs of individual utilities will help dictate the choice of applicable technologies as they become commercially available.

Pre-Combustion Technologies

Before it is burned, coal can be cleaned and/or mixed with other substances to enhance combustion efficiency, to reduce the cost of maintaining boilers and equipment, and to remove potential pollutants. Physical coal cleaning methods involve grinding the coal into a sand-like powder and separating out impurities, resulting in removal of 20 to 50 percent of the coal's sulfur content. Research is aimed at removing up to 90 percent of the sulfur, primarily by grinding coal down further to the consistency of talcum powder. Such "micronized" coal would be 10 times finer than the ground coal produced by current methods. The Coal Cleaning Test Facility near Homer City, Pennsylvania, has spearheaded research in this area since 1981. Its sponsors are EPRI, Pennsylvania Electric Company, New York State Electric and Gas Corporation, and ESEERCO.

Other physical coal cleaning approaches focus on different ways to remove impurities during the cleaning process. Some techniques involve treating the ground coal with an oil-based substance that adheres only to coal particles and not to impurities. After the treated coal powder is agitated, impurities can be removed efficiently. In another approach, magnetic force is used to remove sulfur.

In a water-based system, once coal is ground to a very fine powder and cleaned, it must be dried or "dewatered" for shipping and burning. Established dewatering methods are unlikely to work well with extremely fine coal powders. Research is directed at developing new dewatering methods, such as one using microwaves, as well as ways to force cleaned coal particles to "agglomerate" or bind together.

Other coal cleaning approaches involve the use of chemicals, microwave energy, and even bacteria. For example, one research group is using Freon in a cyclone separator to remove up to half of the overall sulfur content (both pyritic and organic) in very fine coal. Another project, based on the fact that microwaves pass through coal but not through sulfur or other impurities, has reduced ash and sulfur by almost 90 percent in laboratory tests.

Southern California Edison Company

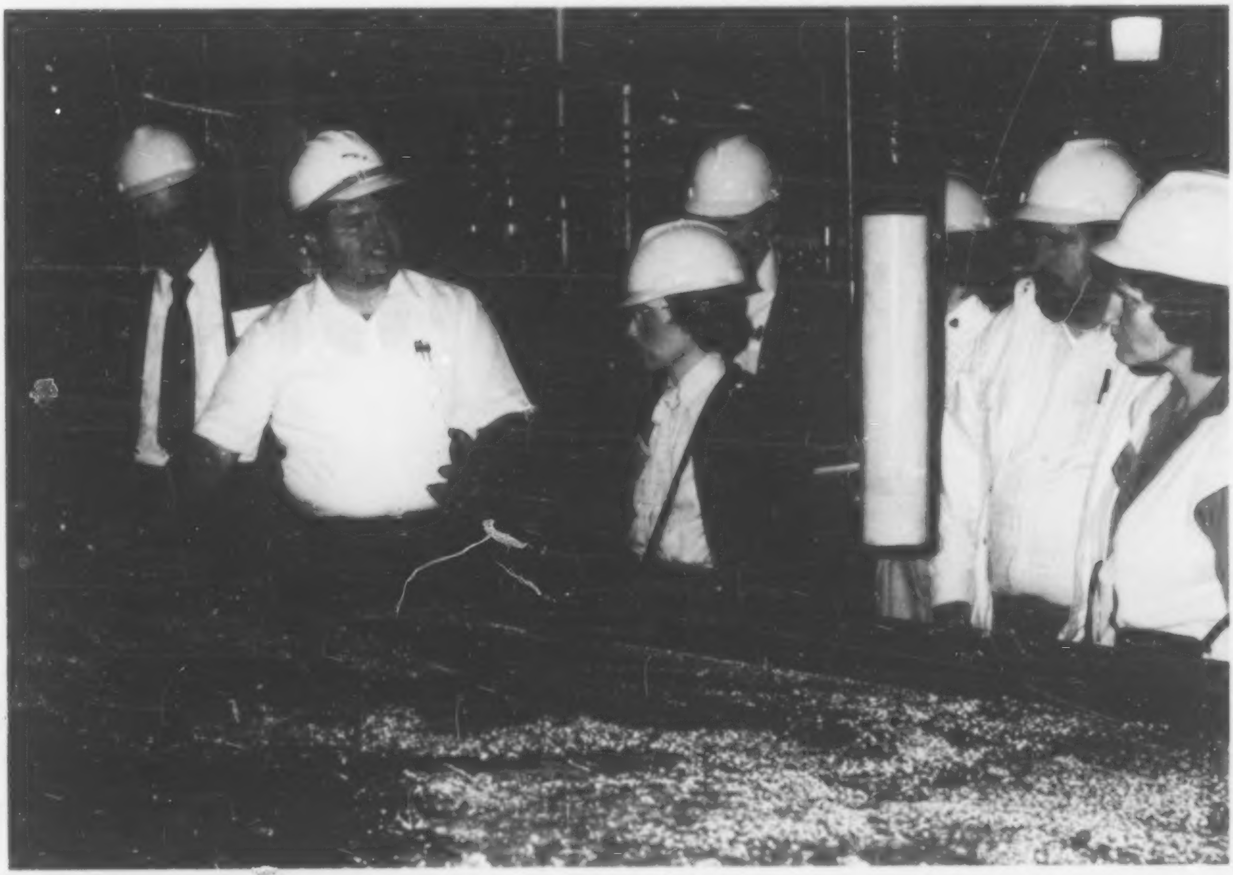
And in yet another experiment, bacteria removed 90 percent of the organic sulfur from coal in five to ten days.

Once coal has been reduced to a relatively clean powder, it can be mixed with oil, water or other substances to be burned instead of oil if necessary. Coal/oil mixtures, first used in the 1920s, are presently commercial in the United States, but are seldom used by utilities due to their high cost. Coal/water "slurries" using 70 percent coal and 30 percent water have burned cleanly in test burns, but utility-scale demonstrations have not taken place. Pipeline slurries using 50 percent coal and 50 percent water, demonstrated domestically 20 years ago, may help bring relatively inexpensive coal-based energy to power plants located far from coal-mining regions.

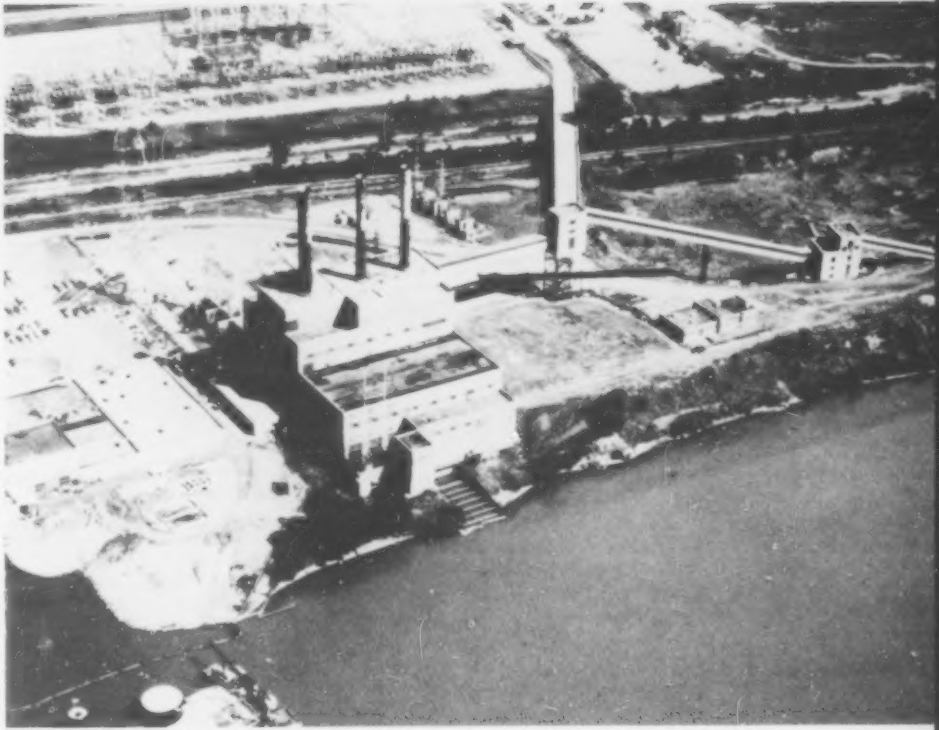
New Coal Combustion Techniques

Much of the excitement over new coal technology focuses on processes which modify the way in which coal is burned in order to remove potential pollutants during combustion and to improve thermodynamic efficiency. In addition to the atmospheric fluidized bed combustion approach being tested near Paducah, Kentucky, major utility demonstrations of this technology also are being built at Burnsville, Minnesota, (125 MW) and at Nucla, Colorado, (110 MW). The Minnesota facility, to be operated by Northern States Power Company, is scheduled to come on line in 1986. Colorado Ute Electric Association's Nucla plant is scheduled to begin operating in 1987. About 40 industries in the United States have ordered atmospheric fluidized bed boilers, and many manufacturers are vying to enter the market. "Not since the early days of nuclear power have technology developers competed so keenly," stated *Energy Daily* July 3.

Clark Harrison, site manager at EPRI's coal cleaning facility, tells a press tour how the concentrating table works like panning for gold. When coal is slurried onto the ribbed surface, the table shakes and separates the lightweight coal from the heavier impurities.



Edison Electric Institute



American Electric Power Company

American Electric Power wants to convert this conventional coal-fired plant to a super-efficient pressurized fluidized bed combustion facility.

In atmospheric fluidized bed combustion, powdered coal mixed with limestone is burned while suspended on a "bed" of air. The calcium in the limestone combines with the sulfur in the coal to form a dry, solid waste product, calcium sulfate. In this manner, not only is the need for scrubbers eliminated, but the solid waste disposal problem is minimized. Furthermore, the process uses lower combustion temperatures, resulting in lower nitrogen oxide emissions. Atmospheric fluidized bed combustion offers unprecedented fuel flexibility; it can cleanly burn such low-grade fuels as peat, tree bark, industrial and sewage sludge, oil shale, lignite, and even cow manure.

A more advanced version of the fluidized bed combustion concept is the pressurized fluidized bed combustor (PFBC), in which hot pressurized combustion gases are used to power a gas turbine. Waste heat from that process, in turn, produces additional steam to drive a turbine. This combined cycle increases the efficiency of the total process—to about 40 percent, from standard levels of about 33 percent. Research focuses not only on demonstrating the technology, but also on preventing abrasive particulates from eroding turbine blades and other equipment.

In one pressurized fluidized bed combustion approach, called turbocharged PFBC, gas is cooled in a convection pass above the fluidized bed before it enters the gas turbine. This lower inlet temperature helps reduce gas turbine blade deterioration. Several utilities have expressed interest in this technology, which may eventually offer lower unit cost and shorter construction lead time than some of its competitors. American Electric Power Company has proposed a 70-MW demonstration at Brilliant, Ohio, in cooperation with Babcock & Wilcox and ASEA-PFBC. Power company officials have said that if federal assistance can be obtained, the plant could be operating by 1990.

In addition to modifying the combustion process with technologies such as fluidized bed combustion in order to reduce sulfur oxide emissions, combustion modifications can also be made to reduce nitrogen oxide emissions. Low-NOx burners are commercially available; advanced low-NOx burners, presently being introduced to the market, reduce emissions further by controlling the fuel/air mix, temperature, and combustion chemistry.

In the future, new low-NOx burners could be retrofitted along with another new combustion modification system that reduces sulfur dioxide emissions: furnace sorbent injection. The leading furnace sorbent injection system is the limestone injection multistage burner (LIMB), which introduces dry limestone directly into the combustion furnace to capture the coal's sulfur content. EPA- and EPRI-funded research aims to improve this technology's efficiency and reliability and to achieve a 50 to 70 percent reduction in sulfur dioxide emissions. The largest LIMB projects include a 640-MW boiler operated by the Pennsylvania Electric Company and a 104-MW demonstration at Ohio Edison's Edgewater plant.

Post-Combustion Pollution Control

If potential pollutants cannot be removed from coal before or during combustion, then post-combustion pollution control measures must be used by many power plants. The most problematical pollutant is sulfur dioxide; the major sulfur dioxide removal method, as mentioned earlier, is flue gas desulfurization. EPRI has invested $50 million to date in efforts to improve this technology's performance. EPRI's research, to be augmented by an additional $50 million investment over the next five years, includes failure cause analysis, process chemistry improvement, materials study, hardware design, study of water and energy use, and the collection and interpretation of performance data.

Advanced scrubbing concepts, currently being tested with federal and private sector funds, may supplant flue gas desulfurization in the long term. In one approach, electron beams pass through combustion gas that has been treated with ammonia, converting sulfur dioxide and nitrogen oxides to dry materials.

In an important first step at the end of July 1985, the House of Representatives voted $500 million over the next three years. . . . The focus now shifts to the Senate.

Post-combustion pollution control technology also includes the use of baghouses and electrostatic precipitators to remove particulates from combustion gases. A baghouse is an array of bags, typically about 50 feet long, with powerful fans that vacuum particulates out of flue gases. In a precipitator, electrically charged particulates are attracted to high-voltage metal plates. The performance of precipitators can be adversely affected by scrubbers and other pollution control equipment. For this reason, industry and government are seeking to upgrade existing precipitator technology, as well as developing advanced systems.

Coal Gasification, Liquefaction, and Combined Cycle Systems

Another pollution control approach is to change the coal into a clean liquid or gaseous fuel prior to combustion. Coal-based synthetic fuel technology was developed in

PROSPECTS FOR FEDERAL SUPPORT

Federal support for a proposed clean coal technology program is likely, but it faces an arduous journey through the Congressional appropriations process. The Administration, and hence the Department of Energy (DOE), has stated that commercial demonstrations of new technologies should be conducted by the private sector, without government support.

Last year, Congress established a $750 million Clean Coal Technology Reserve (CCTR) in Public Law 98-473, the continuing appropriations resolution. The purpose of the CCTR was to support cost-shared demonstrations of clean coal technologies in electric utility and large industrial applications.

Congress also directed DOE to solicit "expressions of interest and informational proposals" from industry. DOE did so last November, stating that it had no resources to fund any of the proposed activites and did not anticipate funding any of the proposals submitted. Nonetheless, it received 175 responses, with project values totaling over $8 billion. Investor-owned electric utilities responded with over 30 proposals.

Congress must now appropriate funds for the program before projects can be initiated. In an important first step at the end of July 1985, the House of Representatives voted $500 million for the program over the next three years, after defeating an amendment to cut funding to $100 million. The funds would be provided as follows: $100 million in FY 86, $200 million in FY 87, and $200 million in FY 88.

The focus now shifts to the Senate, where consideration of funding for the program is expected to take place in mid-September. Should the Senate action differ from that taken by the House, those differences will have to be resolved in a Senate-House conference.

Atmospheric fluidized bed combustion offers unheard-of fuel flexibility as well as up to 95 percent sulfur removal. Now TVA and its partners plan to scale up to 160 MW at Paducah.

Tennessee Valley Authority

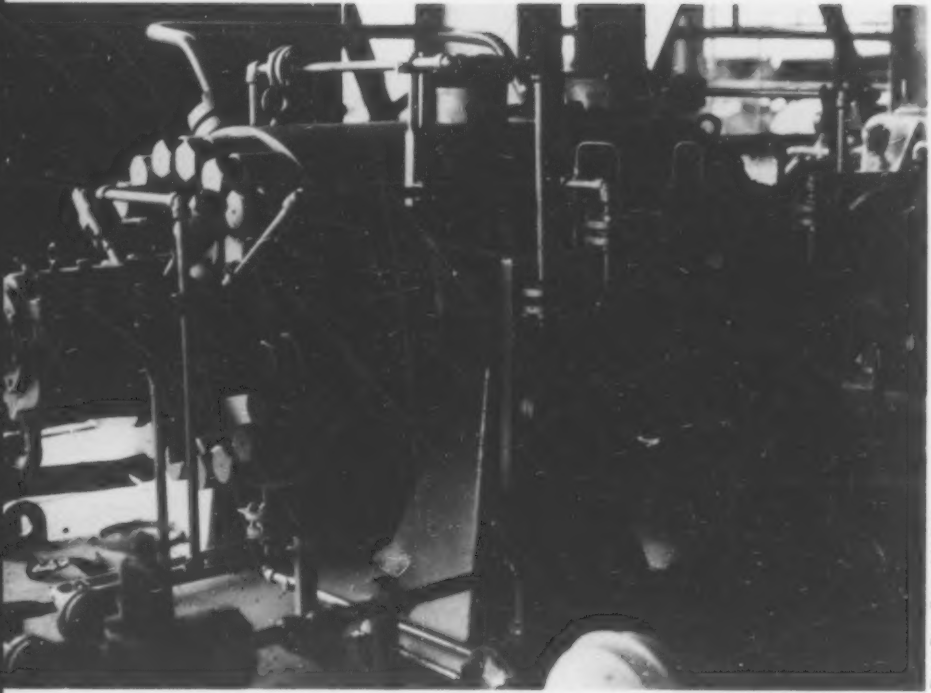
Germany during World War II. Since then, synfuels interest in the United States has waxed and waned with fluctuations in oil price and availability. Despite current low oil prices, however, there is renewed interest in synfuels technology that can meet the constraints of today's power plant economics.

One such technology, noted earlier, is integrated gasification combined cycle, as presently being demonstrated at the Cool Water plant near Daggett, California. At Cool Water, coal is first converted to a clean synthetic gas in a gasifier developed by Texaco. (Other gasification combined cycle facilities may use different gasifiers.) The resulting hot gas (2,300-2,800 degrees F) must be cooled before being desulfurized and then fired in a gas turbine. The cooling process yields high-pressure steam. Both the steam and the cooled gas are used to generate power in a combined cycle turbine system. Then waste heat from the gas turbine is recovered and used to generate steam for additional power generation. The total energy conversion efficiency is about 37 percent.

Recent EPRI studies indicate that a power plant of 500 or 600 MW using the Cool Water technology would cost about 10 percent less to build than a new direct coal-fired power plant with flue gas desulfurization. Its economic attractiveness is due primarily to its modular construction. Prefabricated power plant units can be delivered relatively quickly, reducing construction lead times and capital risk. Modular construction could enable utilities to order smaller units to more closely match supply with demand and minimize "rate shock."

Cool Water's emission rates during its first year of operation were far below permissible EPA levels. The mineral residue from the combustion process, recently classified as non-hazardous by California authorities, can be used as material for insulation and road building. Yet another environmental benefit is the plant's reduced water use—about a third less than a conventional coal-fired power plant with flue gas desulfurization.

"Although the Cool Water plant represents only one approach to GCC technology and presently has been fired on only one type of coal," said EEI's Kuhn, "we believe it offers significant insights into the potential of this technology to utilize many qualities of coal in environmentally acceptable ways in both new and retrofit situations." Illinois #6 and Pittsburgh #8 are scheduled for test runs later this year and early in 1986.



Fluid bed feedwater pumps at the 20-MW Paducah plant supply water to the boiler to make steam.

Electric Power Research Institute

While the Potomac Electric Power Company is contemplating its 360-MW gasification combined cycle power plant in Maryland, Virginia Power has proposed a similar project using a slagging Lurgi gasifier. Interest in this technology also has been expressed by the Cleveland Electric Illuminating Company and the Nevada Power Company.

Although gasification combined cycle seems to be a leading synthetic fuel technology, other synfuels processes may be applicable to utilities' special needs in the future. Coal liquefaction, for example, could provide a "hedge" against potential oil price hikes. Technologies such as the solvent refined coal process and the Exxon Donor Solvent process, which have been studied by government and industry since the early 1970s, could provide fuels for use in conventional oil-fired burners.

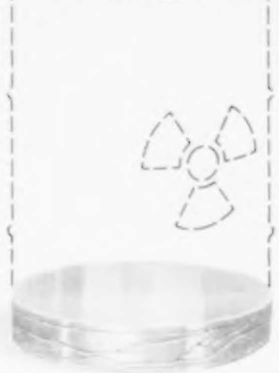
Advanced Coal-Based Systems

The use of coal can extend beyond the limits of combustion technology. Advanced processes can extract the energy from coal without the inherent environmental effects of fossil fuel burning. In fuel cells, for example, coal is first transformed to hydrogen-rich gas; then, instead of being burned, the gas is fed to a power section that extracts energy electrochemically. Research and demonstration will continue to develop fuel cells with different materials used as electrolytes, including phosphoric acid, molten carbonate, and solid oxide.

In an even more advanced technology, magnetohydrodynamics (MHD), coal's energy is converted to an extremely hot gas called a plasma. The plasma is "seeded" with potassium salts, both to improve its conductivity and to remove its sulfur content. The hot seeded gas moves at ultrasonic speed through a channel, which is surrounded by a very powerful magnetic field. Passing through the magnetic field, the hot gas generates electricity, which is tapped by electrodes in the channel wall. The hot gas gives up about 25 percent of its energy in this manner; some of the remaining energy can be recovered for use in a conventional steam turbine system. Such a system in commercial use could have an overall efficiency of about 50 percent.

Federal Help is Needed Now

These and other technologies currently under development could radically change the way that coal is used to provide reliable electric power. For these new technologies to have an environmental and economic impact soon enough, however, an accelerated commercialization program must begin immediately, according to EEI's Kuhn. "Clean coal technologies must be demonstrated at or near commercial scale before they will have the confidence of the electric utility industry and the agencies which regulate it," he said. "Federal participation could accelerate technology development, thereby assisting the U.S. economy with expanded and more efficient coal utilization." EP



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Mark Thomas

What Tax Reform Really Means

It's not just a political contest between "winners" and "losers."

President Reagan formally unveiled his long awaited plan to reform the federal tax code on May 28, 1985. Over the past several months, the plan has been subjected to close scrutiny by both the House Ways and Means Committee and the Senate Finance Committee. Legislative drafting is scheduled to begin by the middle of September or early October. Providing the Democratic-controlled House and Republican-controlled Senate can reach a compromise on several key issues, tax reform could become reality by the beginning of next year.

The stakes are high. The President's plan, which represents the most thorough overhaul of the tax system since World War II, is the centerpiece of the Administration's second-term economic agenda. Proposed changes in individual marginal tax rates, the maximum statutory corporate tax rate, depreciation schedules, and the investment tax credit, as well as other provisions, could determine the economic well-being of a number of industries for years to come. The emphasis on economic neutrality could alter the structural composition of American industry, facilitating the transition to a service- and high technology-oriented economy. Because of the far reaching consequences, tax reform will almost certainly be a focal point of political discussion at least through early 1986, an election year.

The Objectives of Tax Reform

The concept underlying the President's plan as well as most other proposals to reform the income tax is relatively straightforward. An expanded tax base is combined with substantially lower marginal and average tax rates, while maintaining the same level of government revenue.

While the concept is somewhat simple, the underlying objectives tend to be obscured by proposed changes in a number of specific provisions such as the research and development credit, accelerated depreciation, the deduction for state and local taxes, etc. The emphasis on particular provisions contributes, at least in part, to a misunderstanding of the overall purpose of tax reform. Contrary to a common perception, tax reform is not simply a political contest between potential "winners" and "losers," but rather is based on four fundamental social and economic objectives—capital formation, economic efficiency, equity, and simplicity.

Capital Formation

Capital formation is one of the principal determinants of economic growth. Broadly defined, it refers to the process of accumulating capital through the construction of plant, equipment, and housing; discovery and development of natural resources; research and development of new products and processes; and improvements in the education and skills of workers. By foregoing current consumption (saving) and investing in more productive forms of capital, a society provides for a higher standard of living in the future. Indeed, the relationship between capital formation and economic growth is clear: the larger the percentage of gross national product devoted to investment, the greater the economic growth rate.

Tax policy can promote capital formation through either investment incentives or saving incentives. Unfortunately, the current tax structure encourages dissaving (borrowing) as opposed to saving and often promotes the wrong type of investment.

Current incentives to promote domestic saving have been generally ineffective; the domestic rate of saving since the Individual Retirement Account went into effect in 1982 has averaged 5.8 percent, compared to a 6.6 percent rate of saving from 1975 to 1981. This does not imply, however, that domestic saving cannot be influenced by tax policy. The repeal of consumer interest deductions, either in full or the inflationary component, would reduce aggregate borrowing and, as a consequence, increase the pool of available saving. A significant reduction in the federal deficit would also increase the pool of saving available for investment.

Pro-saving incentives that increase the after-tax return on saving are essentially based on intuition and faith; the relationship between the rate of return on saving and the rate of saving is theoretically ambiguous and empirically inconclusive. Nevertheless, it

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H. David Seawell Fotog. Inc

Can tax reform simultaneously provide for capital formation, economic efficiency, equity, and simplicity? Or is it all wishful thinking?

could be argued that the exclusion of saving from taxable income is justified since it improves the allocation of resources between present and future consumption.

A number of provisions have been introduced into the federal tax code in an effort to promote investment. The Investment Tax Credit (ITC), which was first adopted in 1962, provides corporations with a 6 to 10 percent first year write-off against the cost of new equipment. Accelerated depreciation methods were first adopted in 1954; in 1971, the Asset Depreciation Range (ADR) was adopted to encourage modernization of industrial capacity and to simplify administration. The Accelerated Cost Recovery System (ACRS) was adopted in 1981 to offset an escalating rate of inflation, enhance corporate cash flow, and reduce the after-tax cost of capital. The following year the Tax Equity and Fiscal Responsibility Act (TEFRA) modified the ACRS depreciation allowances planned for 1985 and 1986 and reduced the basis for cost recovery deductions by half the amount of the ITC.

Most investment incentives are conceptually similar; they reduce the after-tax cost of capital associated with a particular type of investment. Consider, for example, the difference between the present system of depreciation (ACRS) and the Real Cost Recovery System (RCRS), the depreciation system proposed by the Department of the Treasury in November 1984. On a discounted basis, the depreciation allowances under RCRS are on the order of 12 percent less than those allowed under ACRS. When coupled with the loss of the ITC, a 12 percent reduction in the present value of depreciation allowances would increase the after-tax cost of capital by 2.9 percent under a 46 percent statutory corporate tax rate. If RCRS and the loss of the ITC were coupled with a 33 percent tax rate as proposed under the original Treasury plan, the after-tax cost of capital would still rise by 1.4 percent.

While this may not seem substantial, a number of investments are only marginally profitable; several hundred basis points can and often do determine whether an investment project is undertaken. Moreover, when aggregated over the entire economy, relatively small changes in the after-tax cost of capital result in multi-billion-dollar changes in investment and economic activity. Finally, changes in investment tend to be cumulative over time; a higher level of investment generates a higher rate of economic growth, which generates a higher level of investment, and so on.

Practically every recent study conducted on the relationship between tax policy and investment is based on the Hall-Jorgenson formula for the price of capital. The formula equates the price of capital with a number of variables, including the present value of depreciation allowances for tax purposes, the investment tax credit, and the corporate tax rate. The equation yields two important results. First, an increase in the corporate tax rate increases the cost of capital, while an increase in the investment tax credit and the present value of depreciation allowances decreases the cost of capital. Second, an increase in the investment tax credit and the present value of depreciation allowances has a much greater impact on the cost of capital than a

The fate of the investment tax credit could affect many industries.

Dale Thompson Photo, Inc.

comparable reduction in the corporate tax rate.

The Hall-Jorgenson cost of capital has been used extensively in a number of econometric studies designed to estimate the impact and duration of tax policy on investment. However, such studies have reached different conclusions depending on the assumed duration of the effect and the theoretical relationship between capital and other inputs in the production process. Nevertheless, the qualitative results are the same—the elimination of the investment tax credit and a reduction in the present value of depreciation allowances, combined with a compensatory decrease in the corporate tax rate, reduce aggregate investment and, as a consequence, economic growth.

This latter point is especially significant since some of the tax reform proposals currently under consideration would eliminate the ITC and replace ACRS with a less generous depreciation schedule in exchange for a lower corporate tax rate. The loss of investment incentives has evoked considerable opposition from capital-intensive industries as well as some prominent economists.

Finally, it should be emphasized that tax policy should not be directed exclusively at investment. In the long run, a nation's level of investment is determined to a substantial degree by its available pool of saving. Public tax policy aimed at promoting business investment should thus be viewed as a complement rather than as a substitute for saving incentives.

Economic Efficiency

In the absence of noncompetitive markets, social externalities, institutional restraints, and government subsidies and taxation, a market economy will attain an optimal allocation of economic resources—optimal in the sense that no one can be made better off without making someone else worse off. Any departure from the optimum engenders a loss in economic efficiency. The magnitude of the loss depends on the degree of price distortion and the number and dollar value of the goods subject to distortion. In general, the greater the divergence from the market-determined relative price, the greater the loss in economic efficiency.

Unfortunately, the current tax structure encourages dissaving (borrowing) as opposed to saving and often promotes the wrong type of investment.

From the standpoint of economic efficiency, an ideal tax would only interfere with private decisions when social costs are not adequately reflected in market transactions. Apart from such considerations, an efficient tax would be neutral. It would not influence individual or business decisions on how income is earned or spent. It would not favor leisure over work, consumption over saving and investment, or one particular type of investment over another. It would neither encourage nor discourage risk-taking or the formation of new businesses. It would not grant special preferences to particular industries or to particular types of financial institutions. In short, an efficient tax would not alter the market-determined allocation of economic resources.

In practice, such a tax is neither politically nor administratively feasible. Nevertheless, public finance economists have identified a number of principles which would facilitate economic efficiency.

- *The income tax should avoid high marginal tax rates.* High marginal tax rates give rise to tax shelters and increase the incentive to reallocate saving away from heavily taxed investments into less heavily taxed or tax-free investments.

- *The income tax should not distort the choice between present and future consumption.* Under the current tax system, resources available for future consumption are taxed twice: first, on the original income stream and, second, on the interest earned on the income stream. Double taxation provides an incentive to increase consumption and reduce saving, a questionable policy given the deficient rate of capital formation.

- *The income tax should be fully indexed to offset purely nominal changes in income.* This requires that the standard deduction, the personal exemption, interest income and deductions, tax brackets, capital gains, and the value of inventory are automatically adjusted for inflation.

- *The tax system should not distinguish between different types of economic income.* Corporate income should be taxed at the same rate as noncorporate income, capital gains at the same rate as other types of taxable income, and physical capital at the same rate as human capital.

- *Dividends distributed to stockholders should be fully deductible.* Under the current corporate income tax, dividend earnings are taxed twice: once as corporate income and again upon distribution to shareholders as personal income. This has some unfavorable consequences. First, it distorts the allocation of capital by subjecting firms with comparable earnings to substantially different rates of taxa-

EDISON ELECTRIC INSTITUTE SUPPORTS PRESIDENT'S TAX REFORM PROPOSAL

In testimony before the House Ways and Means Committee on July 25, 1985, James J. O'Connor, Chairman, President, and Chief Executive Officer of Commonwealth Edison Company presented the views of Edison Electric Institute (EEI) on the President's tax proposal. The following is excerpted from his statements:

"EEI supports reform and simplification of the Internal Revenue Code to achieve fair and equitable individual and corporate taxation. However, it is important that our system of taxation continue to encourage economic growth. We therefore also support the objectives of the President's proposals that would retain capital-formation incentives, which are critical to the electric utility industry. The capital formation incentives contained in the Code, such as the investment tax credit and accelerated depreciation, provide a substantial portion of the capital needed for electric utility construction.

"Of the President's proposals, the repeal of the investment tax credit, the elimination of tax-exempt financing for private purposes, and the expiration of tax-deferred dividend reinvestment would have significant detrimental effects on capital formation for utilities. Although the overall effect of the President's proposals on our companies will be adverse because of our capital-intensive nature, the effect of these proposals on electricity customers generally is beneficial. Therefore, we support this tax reform package if the proposed Capital Cost Recovery System (CCRS), including normalization, is retained in substantially its present form and if reasonable transition rules are adopted for any repeal of the investment tax credit. In this latter regard, we are pleased, Mr. Chairman, that both you and Secretary Baker have agreed to develop appropriate 'grandfather' and transition rules for the investment tax credit.

"The electric utility industry is one of the most capital-intensive in the United States. On average, electric utilities need $2.74 of capital investment for every dollar of sales, whereas most other U.S. industries need less than $1.00 of capital investment for every dollar of sales. Since 1982, the trend has been to reduce the capital-formation incentives included in the Code. Unfortunately, the President's proposal would continue this trend.

"Despite the views expressed by some that electric utilities have surplus electric-generating capacity, we would urge this Committee to keep in mind that by 1993, using a moderate rate of growth in the demand for electricity of 2.5 percent annually, this country will have a need for a 28 percent increase in new generating capacity. To put this in perspective, this is about seven-and-a-half times the projected summer peak load for the State of New York for 1985. Further, capital requirements arise from the need for transmission and distribution facilities, which soon will constitute about 40 percent of the industry's construction expenditures.

"This clearly demonstrates that utilities must build to meet the demands placed upon the industry by their customers. Although conservation, load management, and the development of renewable energy resources have helped to reduce these demands, they are not sufficient to forego construction of new electric-generating capacity. If we as a nation were to experience gaps in the reliability of our electricity supply, the result would be a severe blow to our economic growth, with subsequent loss of jobs and income, and a weakening of the nation's competitive position in the world economy."

O'Connor went on to detail the industry's recommendations on certain specific parts of the President's plan:

Capital Cost Recovery System

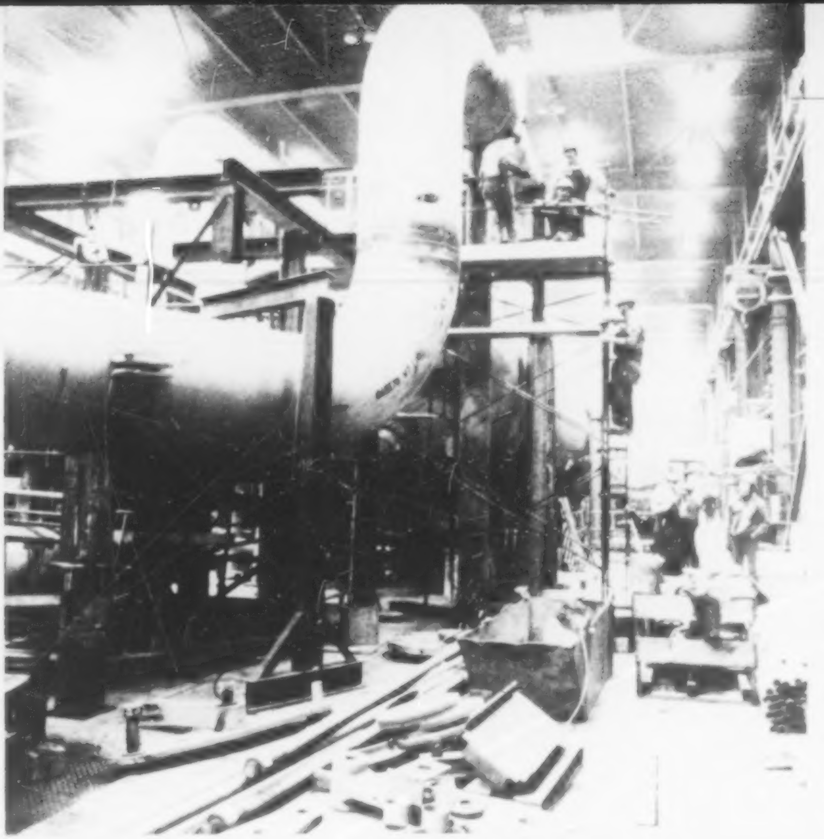
"EEI supports the concept in CCRS of neutral investment incentives for equipment of all industries. This concept is consistent with the theme in the President's tax reform package that a 'level playing field' is intended for investments for all taxpayers. In the past, electric utility property too often has been singled out for disproportionately long recovery periods. This longstanding, unjustified disparity presumably would be corrected under CCRS as proposed.

"Under CCRS, all depreciable assets would be categorized in one of six classes, with assets in each class having similar economic depreciation periods. A level playing field would be more nearly created by providing equal economic treatment for all property in classes one through five. As explained in the President's proposals, the recognition of inflation by indexing capital assets is essential to attain economic neutrality. We commend this approach. The electric utility industry nevertheless would pay a high price under the President's proposals because CCRS would not provide capital equal to that of the combination of ACRS and the investment tax credit. Therefore, if the present inclusion of electric utility property in class five under CCRS were to be changed to inclusion in a class with a longer recovery period, then our industry would be even more severely disadvantaged, and the playing field would become so 'unleveled' that we could not support the President's proposals."

Normalization

"The benefits to the electric utility industry under CCRS would contribute to capital formation *only if* such benefits are normalized consistent with rules in existing law and in the President's proposals." [Normalization is the process by which tax benefits are evenly spread out to consumers over the life of an asset.] "Normalization allows electric utilities to compete on a more level playing field with other providers of energy and in the capital markets. Normalization therefore should be treated as part of the concept of investment neutrality.

"We are pleased that the President recognizes the need for normalization provisions similar to those in present law. Regulated companies should be re-



Electric utilities depend on capital formation incentives in the tax code to help finance construction to meet future power demand.

quired to normalize the tax effect of the timing difference between CCRS depreciation without inflation adjustments and straight-line depreciation of the tax basis of property using lives prescribed for financial accounting and ratemaking purposes. . . . Further, regulated companies also should be required to normalize the tax effect of depreciation differences that would be attributable to CCRS inflation adjustments. . . . Inflation indexing can also be thought of as supplanting, in part, the investment tax credit. Appropriately, therefore, the effect of depreciation of inflation adjustments should be required to be ratably flowed back by regulated companies over the life of the related asset in a manner similar to the treatment prescribed under current law for regulated companies for the investment tax credit. . . . If the normalization requirement were violated, then regulated companies should not be permitted to use CCRS depreciation. Normalization would assure a sharing of the benefits of CCRS between a utility's present customers and its future customers."

Investment Tax Credit

"The repeal of the investment tax credit would be particularly detrimental to the electric utility industry. The credit has provided an important source of capital to help finance the construction of needed electric-generating facilities and transmission and distribution facilities. A loss of the credit would require significant increases in external financing.

"If the investment tax credit is to be repealed, several aspects related to the repeal need to be addressed. Our major concerns are the absence of transition provisions, the regulatory treatment of unamortized credits, and the ability to utilize credits unused as of December 31, 1985."

O'Connor continued by saying that utility property should be covered by ITC transition rules if construction has begun or a binding contract has been entered into. This will protect utilities that made decisions to construct equipment or are continuing construction based on current rules. Similar rules were enacted in 1969 when the credit was last repealed.

Under present law, unused investment tax credits can be carried over to future taxable years. These unused credits should remain available even if the credit is repealed.

O'Connor noted other proposals in the President's tax reform package that must also be examined, including:

- The provision to tax so-called excess depreciation, with respect to assets having 10- and 15-year recovery periods, is unduly harsh. If this provision is enacted, more equitable treatment would be payment of the taxes over the life of the asset or 10 years, whichever is shorter.
- In capitalizing construction period interest, the definition assumes that 100 percent of construction is financed by borrowed funds. Regulatory constraints require utility construction to be financed through both debt and equity financing; therefore only the debt portion of construction should be capitalized under the proposal.
- The alternative minimum tax should not hurt those companies that have unused investment tax credits that have accumulated under present law, as these are the companies usually least able to afford the tax. Therefore, the credits that would be allowed against the regular tax should be allowed as a credit against the alternative minimum tax.
- The dividends-paid deduction is an attempt to reduce the multiple taxation of corporate earnings. For electric utilities, it is reasonable to assume that regulators would use the reduced tax liability resulting from the dividends-paid deduction to lower rates for electric service by allocating the benefits to ratepayers and not to shareholders. A more efficient approach would be to provide this as a credit or deduction at the shareholder level.
- Proposals affecting employee benefits would hamper efforts to provide adequate retirement funds through private plans, and extensive changes would be unfair to employees who made investment and saving decisions based on current law. In addition, taxing health care benefits could discourage participation in private programs, resulting in greater burdens on publicly funded efforts.

Schedule W
Deduction for a Married Couple When Both Work
Form 1040EZ Income Tax Return for Single filers with no dependents
Sign your return

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The personal income tax is a convoluted maze with thousands of provisions. Simplifying the tax system would go far to improve taxpayer morale, not to mention tax compliance.

tion. Second, the relative advantage afforded debt financing penalizes small and risky firms which depend heavily on equity financing. Finally, the tax-induced reliance on debt financing undermines the financial health of U.S. corporations, contributing to uncertainty and risk, low interest coverage ratios, low bond ratings, and high interest rates.

- *The marginal effective tax wedge* (the difference between the pre-tax rate of return and the after-tax rate of return on new investment) *and marginal effective tax rates* (the marginal effective tax wedge divided by the rate of return) *for all assets and industries should be equivalent.* Differential tax treatment can cause two types of misallocation. First, intra-industry distortion results from a disparity in tax rates on investment within an industry. Second, inter-industry distortion results from a disparity in tax rates across industries.

- *The tax base should be significantly expanded.* Preferential tax treatment distorts market decisions and induces investment in areas that are otherwise unprofitable. The repeal of preferential provisions would tend to equalize effective tax rates and permit a compensatory reduction in individual and corporate income tax rates.

Equity

An equitable tax should fall equally on taxpayers of similar economic status (horizontal equity) and should distinguish between taxpayers of different economic status (vertical equity).

Horizontal equity requires that individuals (or households) with the same economic income and circumstances bear the same tax burden. This is not always the case under the current system. Numerous deductions and allowances afford some individuals a relative tax advantage over other individuals with the same income. The ability to pay should also be taken into consideration, since unusual circumstances such as excessive medical expenses may impose a financial hardship which is not reflected in economic income. At the very least, a properly designed tax system should assure that individuals with the same income and circumstances pay the same tax.

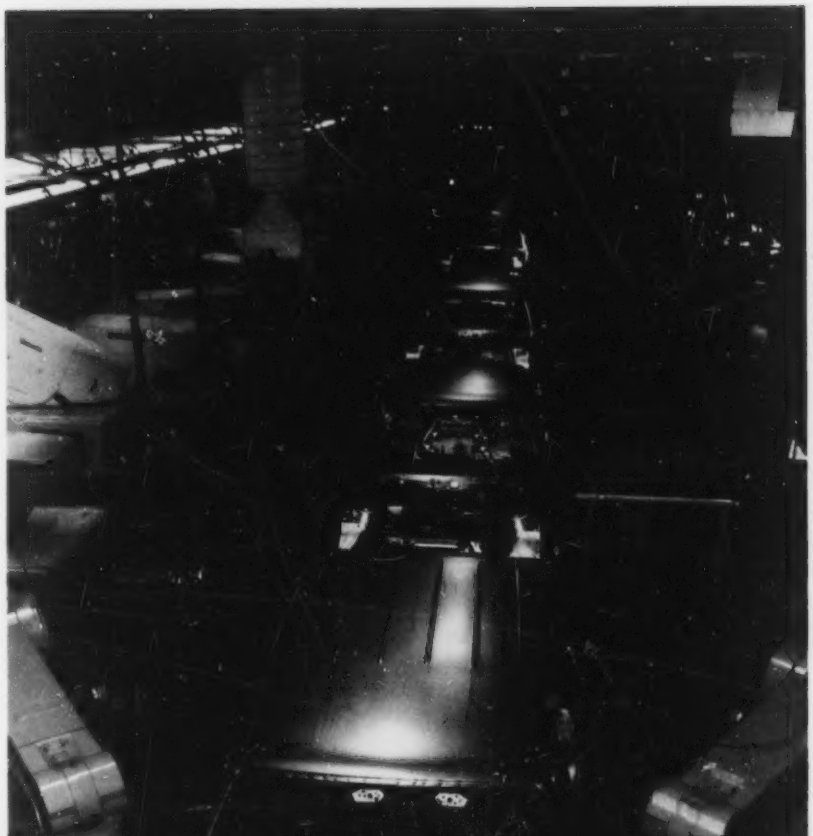
Vertical equity has been a fundamental characteristic of tax policy since the inception of the income tax. Progressivity can be achieved through either incremental increases in the tax rate or by excluding some minimum level of income from taxation. Although both approaches are conceptually similar, exclusionary deductions such as the personal exemption and the zero bracket amount provide greater tax relief for the poor than a highly progressive tax rate schedule. More importantly, from the standpoint of overall policy, exclusionary deductions, unlike high marginal tax rates, do not distort the allocation of economic resources.

Although the relative progressiveness of a tax system is primarily a normative issue, it has economic ramifications. Since higher income groups save on average a higher percentage of their income, there is a trade-off between progressive taxation and the rate of saving. One possible way to resolve this problem is to exclude savings from taxable income. Another possibility would be to distinguish between income from saving and income from other sources, with each source taxed at different progressive rates after excluding a specified amount. Both methods would allow for a progressive tax structure which is compatible with saving incentives.

Simplicity

Tax simplification has been recommended in numerous studies and legislative hearings dealing with tax policy. Nevertheless, the income tax has become an increasingly complicated accretion of preferential provisions. As a result, the income tax is a convoluted maze. *Bender's Dictionary of 1040 Deductions* lists close to 2,000 credits, deductions, exclusions, deferrals, and individual preferences on Schedules A through F of the personal income tax; in addition, hundreds of other provisions are listed for partnerships, estates, trusts, and corporations. The tax code obviously needs to be simplified.

Tax simplification would have a number of benefits. First, it would stimulate the formation of new business. The administrative complexity of the current tax system stifles entrepreneurial initiative. Many new businesspeople are not familiar with the tax provisions



Mark Farris/Foto Inc.

The President's tax plan emphasizes economic neutrality, which could alter the structural composition of American industry.

The tax-induced reliance on debt financing undermines the financial health of U.S. corporations, contributing to uncertainty and risk, low interest coverage ratios, low bond ratings, and high interest rates.

pertinent to their firms, nor can they afford expensive outside expertise. Furthermore, a complicated tax system represents a psychological barrier to the aspiring but inexperienced entrepreneur.

Second, simplification would reduce, perhaps substantially, the time and money spent on compliance. It has been estimated that taxpayers spend over $1 billion annually on professional assistance on tax returns; the federal government devotes over 400 million hours to tax reporting. This results in a tremendous loss of resources which could otherwise be used in more productive activities.

Third, tax simplification would improve tax compliance. The Internal Revenue Service estimates that $100 billion is lost annually through tax evasion. Another extensive study on the subject suggests that the figure may be closer to $200 billion. Regardless of the amount, a simplified tax system would allow the government to reduce its administrative costs and focus its resources on enforcement.

Finally, a simplified tax system would improve "taxpayer morale." The federal income tax is primarily a voluntary tax system; it depends on the honesty of the average American to finance government activities. Voluntary compliance is undermined by a growing belief that others are able to avoid taxation through a vast array of esoteric provisions. Simplification would help to restore the public's confidence in the U.S. tax system.

A Comprehensive Income Tax

As suggested in the foregoing discussion, a well-designed tax system should be efficient, equitable, simple, and favorable to economic growth. Although the current tax system addresses equity and economic growth, it is woefully inefficient and complex. More importantly, the tax system is largely comprised of piecemeal additions and modifications. Until recently, tax policy was seldom if ever motivated by a single coherent objective. The current income tax is, with few exceptions, simply a hodgepodge of well-intentioned, but narrowly focused, provisions. Despite the relative merits of specific provisions, each successive departure from a uniform broad-based tax violates the principle that people with the same income should pay the same tax and imposes higher average and marginal tax rates on a smaller tax base.

One possible solution is to repeal many of the current deductions, credits, exclusions, and preferential tax rates. This is the concept underlying a broad-based comprehensive income tax. In its pure form, a comprehensive tax base would be comprised of every element of consumption and any change in an individual's net worth. This would include earnings, investment returns from realized and unrealized capital gains, gifts, bequests, imputed rent from owner-occupied housing, and transfer payments. In practice, however, it would be exceedingly difficult to account for unrealized appreciation on assets or noncash transactions.

Although a pure comprehensive income tax is neither politically feasible nor practically possible, there are a number of ways to expand the tax base.

A bill sponsored by Senator Bill Bradley (D-N.J.) and Representative Richard Gephardt (D-Mo.), for example, would repeal or curtail a wide range of individual and corporate provisions, while retaining a number of socially desirable or politically palatable provisions such as deductions for state and local income and property taxes, charitable contributions, the Individual Retirement Account and Keogh plans, and interest on general obligation bonds. Bradley-Gephardt would also retain exemptions for workers' compensation, veterans' benefits, and social security benefits for low- and moderate-income individuals.

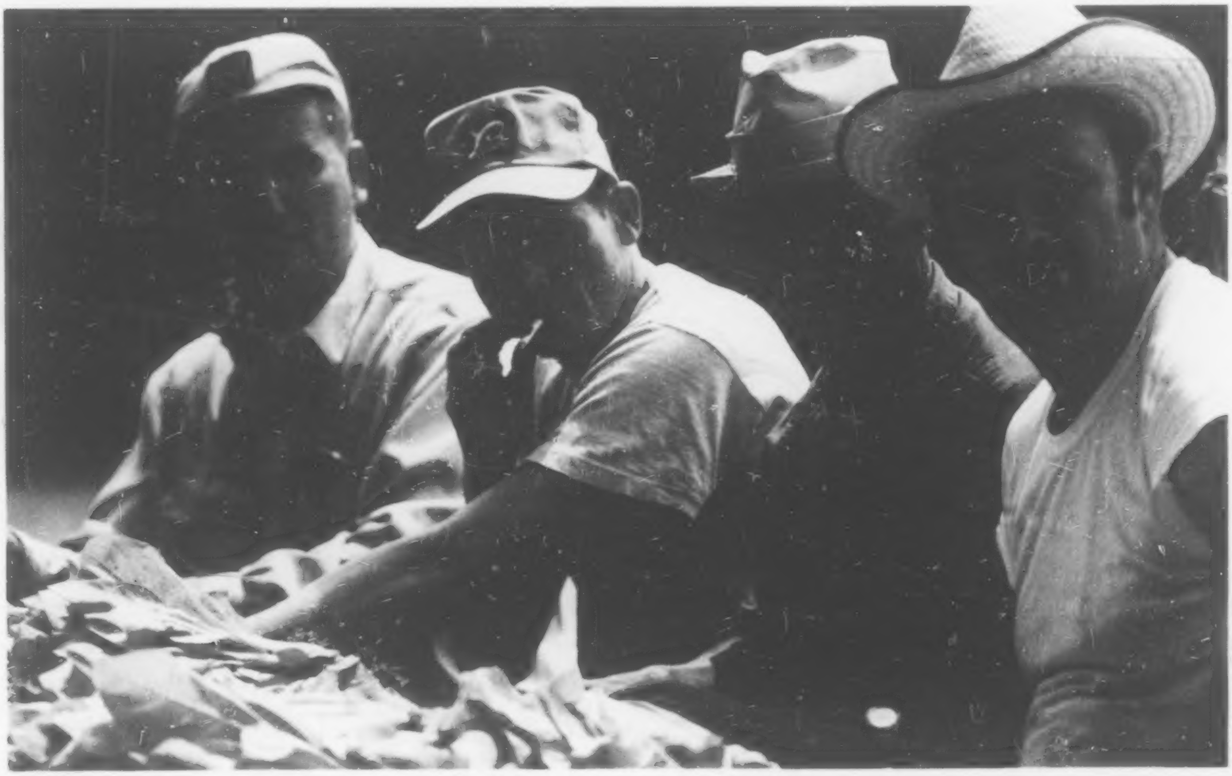
An alternative version has been sponsored by Representative Jack Kemp (R-N.Y.) and Senator Bob Kasten (R-Wis.). Kemp-Kasten repeals the deduction for state and local income taxes as well as a number of other provisions, but retains preferential treatment of capital gains, the deduction for interest on educational loans, percentage depletion, and the intangible drilling cost deduction.

A third possible version, proposed by President Reagan, repeals or curtails a wide range of provisions including the deduction for property taxes, but provides a 10 percent deduction on dividends paid.

All three proposals would retain a number of popular provisions, including deductions for home mortgage interest, excessive medical expenses, charitable contributions, and the Individual Retirement Account. Although other versions could allow for still further deductions, they would depart from the concept of a comprehensive income tax.

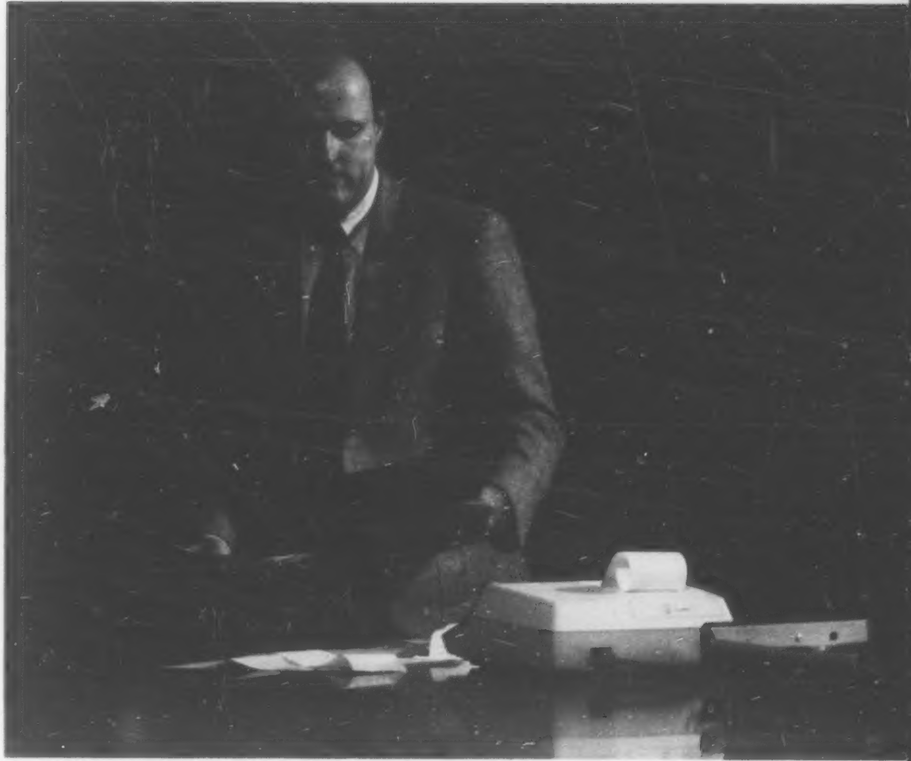
A comprehensive tax has several important advantages over the present tax system. First, it is considered more equitable. Tax experts have observed that higher income groups benefit disproportionately more, on average, than others from the current array of tax provisions. Indeed, the Treasury Department estimates that the top 4.4 percent of taxpayers in

Labor-intensive and research-intensive industries are less dependent on capital formation incentives than are capital-intensive industries.



Robert Madden Foto Inc

Under the present corporate tax system, dividends are taxed twice—once as corporate income and again upon distribution to stockholders as personal income.



Charles Gupton/Uniphoto

1981 (those making $50,000 or more) received disproportionately greater benefits from 13 out of the 33 tax provisions considered. Moreover, the Treasury found that individuals making $100,000 or more (less than one percent of all taxpayers) received 13 percent of the benefits. Studies conducted by the Treasury Department, the Congressional Budget Office, and the Joint Committee on Taxation led these entities to conclude that the elimination of these and other regressive provisions would improve the relationship between taxation and the ability to pay.

Second, a comprehensive income tax would reduce complexity. Between 1967 and 1985, the number of provisions, including tax credits, preferential rates, special exclusions and deductions, and deferrals of tax liability, more than doubled. Over the same period, the cost of tax expenditures defined as provisions that depart from the normal tax structure rose from $37 billion to $365 billion.[1] The elimination of a large number of these provisions would substantially simplify the tax system.

Third, an expanded tax base is likely to reduce noncompliance. A large and growing number of provisions have made tax enforcement more difficult; evidence indicates that exaggerated deductions, unreported income, and unfiled returns are all increasing faster than personal income. A comprehensive income tax should help to reverse this trend and allow the government to concentrate on the most egregious types of tax evasion.

Fourth, to the extent that a comprehensive income tax reduces the differential taxation of economic income, it improves allocative efficiency. A fundamental tenet of economic theory is that an unfettered market economy results in an efficient allocation of economic resources. Governmental intrusion in the form of preferential tax treatment distorts market decisions and channels investment into areas that are otherwise unprofitable. The repeal of preferential provisions would tend to equalize effective tax rates across industries. This would reduce the efficiency loss resulting from inappropriate investment and improve economic growth by ensuring that scarce credit is allocated to the most efficient and productive sectors of the economy.

Finally, a comprehensive income tax makes it possible to reduce tax rates while maintaining the same level of government revenue. It has been estimated that tax rates under a fully comprehensive income tax could be reduced by at least 40 percent without changing the amount of revenue collected. This has important economic implications. Lower marginal tax rates would curtail the use of tax shelters; reduce the tax-motivated bias towards debt financing, capital gains, owner-occupied housing, commercial construction, etc.; and increase labor force participation and productivity. All of this could be accomplished while maintaining the same degree of progressivity.

Some Difficult Choices

The four objectives of tax reform are not fully compatible. A well-designed tax system thus requires some difficult choices. It may be necessary, for example, to choose between a flat-rate tax—arguably the most efficient type of income tax—and vertical equity, or between saving incentives on the one hand and horizontal equity and simplicity on the other. A tax on all economic income would be extremely complex, while the exclusion of saving from taxable income would be particularly unfair to

SPECIAL PROBLEMS OF TAXING INCOME FROM CAPITAL

One especially troublesome problem with the present tax system is the taxation of capital income. The present tax system, with some exceptions, taxes both saving and the income from savings, which increases the price of future consumption relative to current consumption. This reduces current saving and investment relative to the amount that would be saved and invested if taxes were levied only on consumption. Many of the changes in the Federal tax system during the past several decades represent selective measures to reduce the bias against saving and investment. Such changes include limited exclusions of retirement saving and measures to reduce effective tax rates on the income from new investment. The Economic Recovery Tax Act of 1981 further reduced the bias against saving and business investment, most importantly by extending the individual retirement accounts (IRAs) to employees and accelerating cost recovery on business investment. These measures have contributed to the rapid rate of domestic business investment, but they do not appear to have increased the personal saving rate. The substantial remaining bias against saving and investment should be a major focus of future changes in the tax structure.

The current tax system also distorts the pattern of investment spending, because the effective tax rate on new investment depends on the type of asset and the rate of inflation. These distortions have arisen partially because capital income is difficult to measure. For example, to calculate net income it is necessary to deduct the expenses incurred in earning that income, a critical component of which is the depreciation of the capital asset. Unfortunately, "economic depreciation," a concept that measures changes in value arising from both physical deterioration and obsolescence, is extremely difficult to measure accurately.

Another problem is that the tax system is not completely indexed for inflation. Although individual income tax brackets are being adjusted annually for inflation, taxation of capital income is still affected by the inflation rate. Depreciation allowances fall in real value as the price level rises, leading to an overstatement of the real income of businesses. Increases in the value of inventories solely because of inflation may also increase taxable income. Finally, increases in the value of capital assets that merely reflect the increased price level are subject to a capital gains tax upon sale.

Several of the changes in the tax law during the past decade have been advocated as offsets to the unintended effects of inflation on effective tax rates. These changes include the reduction in the taxation of capital gains in 1978 and the accelerated cost recovery system of the Economic Recovery Tax Act of 1981. Although these tax changes reduced the average rate of taxation on the income from new investment, they did not successfully deal with the problem that the effective tax rate varies widely depending on the type of investment and the financing method.

Nonuniform taxation of capital income causes misallocation of capital. One estimate of the cost of this misallocation of corporate capital is that it is equivalent to wasting 1½ percent of the present stock of capital, or more than $5 billion worth of output annually.

Another important feature of the present tax system is the presence of a separate tax on corporate income. There is no necessary role for a separate corporate income tax in a pure income tax system. The income generated by corporations could be directly attributed to stockholders and taxed under the individual income tax system in the way that partnership income is treated. The primary justification for a separate corporate tax is to ensure that retained corporate income is subject to tax. However, the corporate income tax achieves this end only at the cost of introducing a number of distortions to economic behavior. Corporate earnings distributed as dividends are taxed more heavily than other forms of capital income because they are subject first to the corporation income tax and then to the individual income tax. Earnings retained by the corporation may be overtaxed relative to noncorporate business income if the corporate tax rate is greater than the shareholder's marginal individual income tax rate. Thus, the present system can impose a higher effective tax rate on activities carried out by corporations compared with activities performed outside of the corporate sector.

Because interest payments are deductible while dividend payments to shareholders are not, the corporation income tax system provides an incentive to use debt rather than equity financing. This leads to more debt finance than the market would otherwise choose, increasing the vulnerability of corporations to bankruptcy. Because earnings paid out as dividends are taxed more heavily than earnings retained within the corporation, there is a tax incentive for corporations to retain earnings. This may lead to inefficient investment of retained earnings at rates of return lower than those available to the stockholder.

Excerpted from the *Economic Report of the President*, Transmitted to the Congress, February 1985, together with *The Annual Report of the Council of Economic Advisers*, United States Government Printing Office, Washington: 1985.

older individuals who deplete their lifetime savings during retirement. Deductions for excessive medical expenses or the childcare credit affect the ability to pay even if such provisions do not affect economic income.

While the dilemma posed by such choices can be resolved without substantially departing from the overall concept of tax reform, several trade-offs pose an especially troublesome problem. For example, the elimination of the capital gains exclusion coupled with inflation indexing would promote horizontal and vertical equity, improve allocative efficiency, and greatly reduce administrative complexity. It has been argued, however, that the elimination of the exclusionary provision would completely decimate the venture capital financing industry. One possible solution is to provide a special exclusion for venture capitalists. Unfortunately, such an exclusion is arbitrary at best and difficult to enforce.

The proposed elimination of the deduction for state and local income taxes also presents a problem. While the deduction primarily benefits higher income groups, state and local tax revenue is often used to fund social services for the poor. The improvement in equity at the federal level thus may be offset by the inequitable hardship imposed at the local level. Moreover, the per capita cost of governing large metropolitan areas is substantially greater than that of governing small cities or rural areas. Finally, a distinction could be made between the deduction for state and local income taxes and the deduction for property taxes, since property taxes are used primarily to fund public education. Congressman Kemp, for instance, argues that public education represents an investment in human capital and, as such, deserves the same type of treatment as other types of investment.

Finally, it has been argued that the objectives of economic efficiency and capital formation are inconsistent. Although this contention is not without merit, these two objectives can be substantially reconciled, providing other considerations such as equity and simplicity are not given first priority. For example, the full or partial expensing of dividends paid would eliminate the current bias towards debt financing, reduce intra- and inter-industry distortion, improve corporate balance sheets, and reduce the weighted after-tax cost of capital.

Similarly, investment incentives can be easily reconciled with at least one type of efficiency criteria—intra-industry neutrality. Since this criterion simply requires that marginal tax rates on different types of investment be equivalent, tax policy could be very favorable toward capital formation, even to the point of expensing new investment, without significantly distorting resource allocation among different types of investment. This is the concept underlying the Kemp-Kasten "neutral cost recovery system," which provides the present value of investment ex-

Proposed changes in the corporate tax rate and depreciation schedules can affect investment decisions.

pensing without distorting inter-asset investment.

The President also adopted this approach in his proposal. The Capital Cost Recovery System (CCRS) would lengthen recovery periods from the current range of 3 to 18 years to a range of 4 to 28 years. This change would appear to be detrimental to industry. However, according to Treasury estimates, the present value of depreciation allowances under CCRS is greater than that allowed under ACRS.[2] Moreover, CCRS would substantially reduce the variance in effective tax rates across different assets. Finally, the unrecovered portion of an asset's cost would be adjusted for inflation each year.

Reconciling inter-industry neutrality and investment incentives, on the other hand, is a much more difficult task. Since labor- and/or research-intensive industries benefit less from capital formation incentives than do capital-intensive industries, the greater the investment incentives the greater the disparity in inter-industry effective tax rates. This problem can be overcome to some extent by treating both human capital (i.e., higher education, vocational school training, on-the-job training, etc.) and research and development as types of investment; that is, expenditures for such cost would be eligible for tax depreciation. Finally, inter-industry distortion could be further reduced through the expensing of dividend deductions and an across-the-board reduction in the statutory corporate tax rate.

From an overall perspective, the objectives of tax reform are generally consistent. The elimination or curtailment of existing provisions would promote capital formation (through a lower corporate tax rate and favorable depreciation allowances), improve efficiency, promote equity, and simplify the tax code. Other provisions, however, are not easily reconcilable with the goals of tax reform and require some difficult choices; for example, it may be necessary to retain capital formation incentives even if they give rise to differential effective tax rates. Such exceptions notwithstanding, the elimination of deductions, credits, exclusions, etc., coupled with lower average and marginal tax rates, has become an appealing idea; for in addition to lowering the tax liability for a majority of American taxpayers, a comprehensive income tax reconciles four seemingly opposing objectives—capital formation, efficiency, equity, and simplicity.

When asked in 1982 what he thought the chances were that a broad-based, flat-rate tax would be enacted, . . . Milton Friedman responded, "Zero."

An Idea Whose Time Has Come

Genuine tax reform should not be considered a certainty. The tax code consists of a bewildering array of deductions, credits, exclusions, preferential tax rates, and provisions to offset and defer tax liability. A thorough overhaul of the tax system represents a monumental undertaking. Moreover, a number of important issues have yet to be resolved, including the deduction for state and local taxes, preferential provisions for the oil and gas industry, preferential treatment of capital gains, and the system of depreciation. Finally, a proposal which is politically palatable to both the President and Congress must be developed before popular support wanes.

The obstacles to tax reform should not be underestimated. When asked in 1982 what he thought the chances are that a broad-based, flat-rate tax would be enacted, the Nobel Prize-winning economist, Milton Friedman, responded, "Zero."[3]

In spite of the obstacles, tax reform appears to be an idea whose time has come. Public opinion polls invariably report dissatisfaction with the current tax system. This disfavor lends support to a number of recently developed broad-based approaches to tax reform. Although the tax rate, the number and types of deductions, and the overall emphasis may vary, these approaches are comparable in that they substantially reduce marginal and average tax rates and eliminate and curtail numerous individual and corporate provisions.

Recognition of a problem and proposals designed to overcome it, however, do not constitute a solution, since even the proponents of tax reform disagree on a number of important issues. Nevertheless, presidential sponsorship and bipartisan support in both houses of Congress augur well for true tax reform. EP

Notes

1. *Federal Tax Expenditures for Fiscal Years 1984-1989*, Joint Committee on Taxation, 1984.

2. The Treasury compared the present discounted value of CCRS, ACRS, and straight-line depreciation methods on the basis of comparable asset classes and three different rates of inflation. Assuming a 5 percent inflation rate and a 4 percent real rate of return, the present discounted value of CCRS allowances exceeded that allowed under ACRS for all comparable asset classes. However, at a zero rate of inflation ACRS is more favorable than CCRS in four of the six asset classes. At a 10 percent rate of inflation CCRS is much more favorable than ACRS in all six asset classes. Finally, it should be noted that the Treasury did not consider the loss of the ITC in these estimates.

3. Richard I. Kirkland Jr., "The Flatter Tax Movement Picks Up Steam," *Fortune*, July 26, 1982, p. 34.

Bartlett Naylor

Drugs at Work

The business world is grappling with growing alcoholism and drug abuse among employees.

Frank W. grew up in New York City and, like many urban kids, was raised around drugs. When he began working for a Sunbelt utility after a stint in the Navy, he found that smoking a little dope made his shift more pleasant.

Frank is not alone. Alcohol and now drug abuse on the job have become a major challenge for employee management. As *Newsweek* magazine notes, "Joint by joint, line by line, pill by pill, the use of illegal drugs on the job has become a crisis for American business."[1]

Addiction to drugs and alcohol is on the rise in the nation's corporations. A Denver attorney snorts cocaine through a hollowed-out pen. There's the case of a California bus driver who used amphetamines regularly during all-night runs. "Everybody did," he says.

Stock and bond traders on the floor of the New York Stock Exchange sneak out for pills. Brokers at their desks race through their hundred-plus telephone calls a day with the aid of drugs. *Fortune* magazine tells the story of a successful 43-year-old commodities trader. His addiction to cocaine led to fierce paranoia. One night, he imagined his house was surrounded by police officers. He convinced himself that if he stripped naked and climbed out the window, he would be invisible to them and escape. He walked five miles during early morning rush hour traffic down the divider strip of a Long Island freeway before police took him into custody.[2]

In the electronics industry, where top executives are often less than 35 years old, drug use is allegedly widespread.

Nurses and doctors, with easy access to supplies of drugs, have also succumbed. As many as 4 percent of Chicago doctors are addicts, according to one study, a rate nearly double the national average.[3]

Police officers are users. In 1983, the District of Columbia dismissed 35 officers, some of them five-year veterans, for suspected drug use.

Alcohol has long been a problem in the American workplace. Why the apparent drug epidemic? Simply enough, the generation that began in the mid-1960s to explore new mental horizons on the wings of "recreational" drugs has entered the workforce. And habits die hard. What's more, the new generation of career-conscious students is not necessarily shunning drugs and alcohol. It's certainly no secret that teenage alcoholism is rising. And with the price of cocaine declining, that drug is becoming accessible to a greater number of people.

Exactly how deep the problem runs is unclear. It doesn't lend itself to a telephone poll. Drug users and alcoholics alike hide their problems. "Denial is the hallmark of drug dependency," points out Dr. Joe Mattox, a psychologist and the administrator of the employee assistance program at Pacific Gas and Electric Company. Numbers are guesses.

Those responsible for dealing with the situation on the worksite begin with what is perhaps a conservative measurement:[5] 10 percent of the job force are alcoholics, 5 percent do drugs. Some estimates show the figure lower, others even higher.

The National Institute on Drug Abuse says there are as many as five million regular cocaine users. That alone is 2 percent of the population—and nearly 5 percent of the workforce.[4]

"For any company to say there is no problem would be incorrect," says David T. Lewis, manager of supervisory training and responsible for helping establish the employee assistance program at the Nevada Power Company.

And so the electric utility industry and virtually all of corporate America have decided to address drug and alcohol abuse on the job.

Although corporate responsibility is certainly one justification for employee assistance programs, there are other motives. "Healthy employees and those programs that promote their health can help reduce the trend toward ever increasing health benefit costs, absenteeism, and decreased productivity," writes Dr. Charles A. Berry, former chief medical director of the U.S. space program, in a publication of the National Institutes of Health.[6]

"We don't like to lose the investment we have in a regular employee," says Lewis of Nevada Power.

Alcoholics and drug abusers drop things, they run their vehicles into walls, they drop lighted matches on flammable materials, they fail to interpret meters properly, they forget to perform assigned tasks.

Addicts can be thieves. Paychecks often aren't enough to cover a cocaine habit. The worksite can

Bartlett Naylor is a journalist specializing in business and financial issues.

As much as 5 percent of the workforce may use cocaine. Is there a drug epidemic in corporate America?

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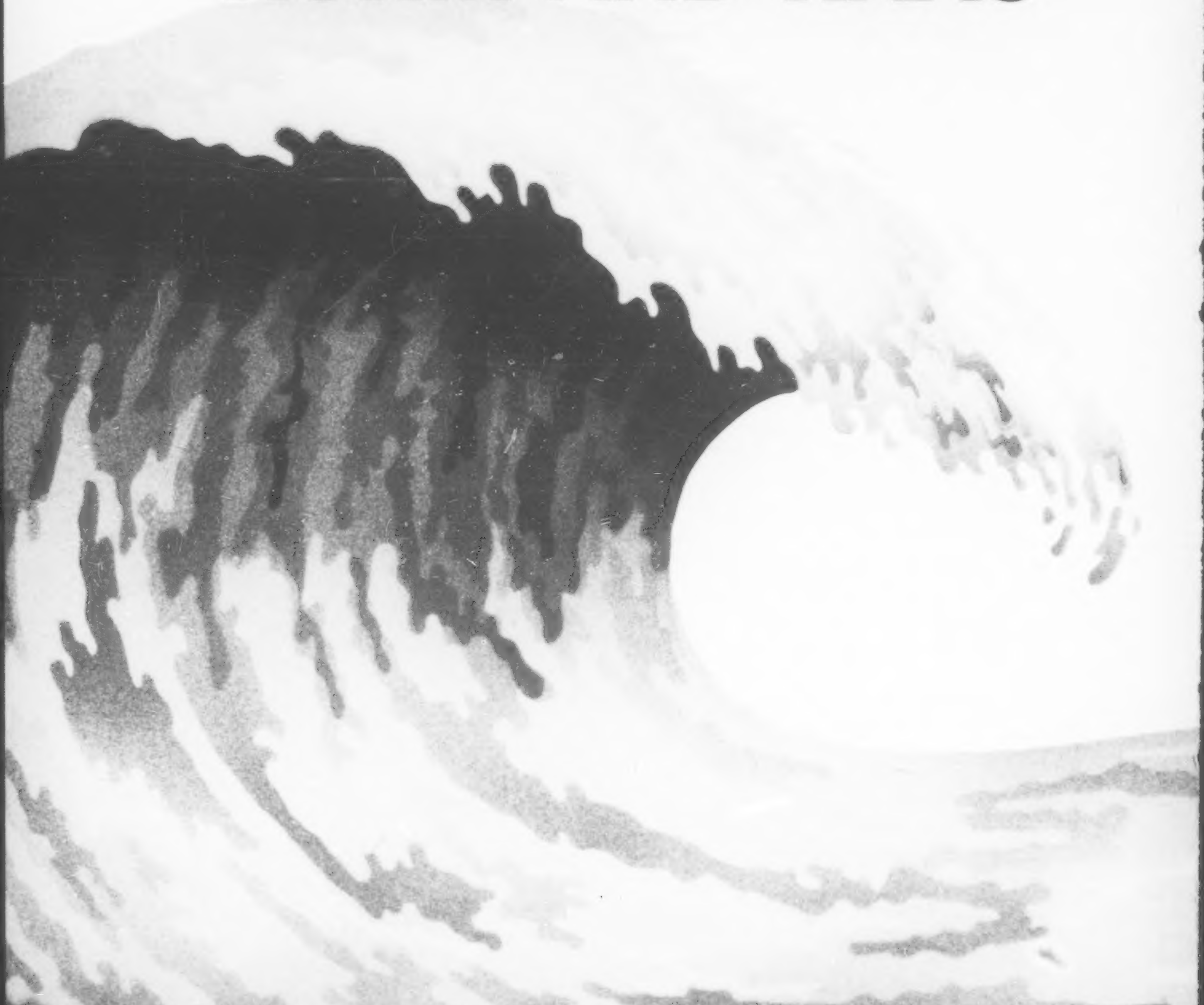

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Amberlyst XN-1010	Amberlyst A-27

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*Average membrane pore size: 40-50Å (~0.005μ)

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Dave Schaeler/Uniphoto

Taking refuge in alcohol, marijuana, cocaine, amphetamines, heroin or other drugs is one way people try to cope with personal problems.

become a source of supplies and equipment that can be stolen and sold for cash—cash used to buy drugs.

Abusers incur higher medical bills, since the drugs erode organs of the body. And accident proneness can lead to damage at the company and also to disabilities. The financial settlement for a disability is a direct cost to the firm.

The costs to American industry of alcohol abuse have been studied longer than the costs of drug abuse. Through the 1970s, for example, the economic costs of alcohol abuse grew from an estimated $30 billion in 1971 to $43 billion by 1975. In 1983, as much as $92 billion was lost because of the problem, according to studies reported by Dr. J. Michael Swint in a publication of the Department of Health and Human Services.[6]

According to Dr. Swint, a professor of economics at the University of Texas Health Science Center in Houston, drug and alcohol abusers have a higher turnover rate. That's due to death or to voluntary or involuntary termination

Dr. Swint points to the need for a corporate response: "The evidence is clear that successful rehabilitation . . . produces substantial benefits to the firm."

Utility executives probably subscribe to this sentiment currently. But it was not always so.

Says Edward Bomsey, manager of employee relations at the Edison Electric Institute, "The problem was initially perceived by business as an exclusively large urban one. There might be problems in Chicago, New York or Los Angeles, but not in Iowa or Utah. And then there's been the problem of covering up. In the old days, where there was a senior employee with an alcohol problem, people would cover up for him. Keep him going so he could make it to a pension, thinking they were helping him. But now people are realizing that drug and alcohol abuse is widespread. They are also learning that allowing the continuing physical and mental harm to the employee caused by substance abuse is definitely not in his or her best interest. Covering up can kill."

In the electric utility industry, there are identifiable leaders in pioneering company substance abuse policies and programs. Georgia Power Company stands out. So do Commonwealth Edison in Chicago, Public Service Electric and Gas in New Jersey, Southern California Edison, and Boston Edison, among others.

Although few efforts can be considered old and established, there is enough experience for the Edison Electric Institute to have published a revision to its 1983 *EEI Guide to Effective Drug and Alcohol*

Policy Development.

Its manifesto is simple: "The electric utility industry recognizes the prevalent use of drugs and alcohol in the United States and the need to provide a drug-free work environment in the interest of employee and public health and safety."

The purpose of the new *EEI Guide to Effective Drug and Alcohol/Fitness for Duty Policy Development* is to "assist companies in developing their own alcohol and drug policies or programs if such programs do not currently exist or might benefit from expansion."

The EEI guide contains 10 key program elements:

- Written policy,
- Effective policy communication,
- Behavior observation training for supervisors,
- Policy guidelines and training for supervisors,
- Employee assistance programs,
- Top management support,
- Law enforcement liaison,
- Union briefing,
- Contractor notification, and
- Chemical testing of body fluids.

Note that establishment of the employee assistance program, or EAP, is only one of the steps in creating what's considered an effective policy.

Established policies communicated to employees vary. At Public Service Electric and Gas Company, for example, the epistle is brief: "A drug-free work environment is especially important in the utility industry because of the basic responsibility of utilities to serve the public safely and without interruption. The responsibility is of even greater significance where nuclear facilities are concerned. . . . Therefore, the unlawful use, distribution, or possession of drugs on company property will not be tolerated."

Others are lengthy, such as the one from Commonwealth Edison Company's. It says that, "While the Company has no intention of intruding into the private lives of its employees, the Company does expect employees to report for work in condition to perform their duties. The Company recognizes that employee off-the-job and on-the-job involvement with drugs can have an impact on the work place and on our ability to accomplish our goal of a drug-free work environment."

In establishing a program, the EEI guidebook cites a number of warning signs to help supervisors. These deal with work performance ("Does the individual have more difficulty concentrating?"), social interaction ("Does the individual 'overreact' to real or imagined criticism?"), and personal health ("Are you aware of any signs of "nerves

POLICY CHECKLIST

In its guide, EEI includes the following checklist to help in shaping a drug and alcohol abuse policy:

1. Do you have a clear, written company policy on drug and alcohol abuse?
2. Has your company given written guidelines on this issue to management and supervisory personnel?
3. Have you provided employees and supervisors with health and safety information on drugs and alcohol and made known the impact that such use on and off the job can have on job performance?
4. Have supervisors been trained to recognize key performance indicators often associated with drug and alcohol abuse?
5. Do your supervisors and management personnel know what to do if they find an employee who may be unfit for duty, under the influence of drugs or alcohol or found in possession of illicit or prohibited substances?
6. If drugs are found on company property or while on company assignment, are local law enforcement and company security promptly notified, and are procedures in place to accomplish this effectively?
7. Is there a medical resource designated for an examination including a urine test for employees suspected not to be fit for duty?
8. Is there an employee assistance program available as a resource to help employees, and are they familiar with how to participate in such a program?
9. Has the company briefed the union, if applicable, on its drug policy?
10. Is the company directing its message at the co-worker as well as the drug and/or alcohol abuser?
11. Have contractors been formally advised that personnel hired by them working on company property or on assignment for the company would be denied access if such individuals violate company drug and alcohol policy and would be referred to local law enforcement if found to be in apparent violation of the law?
12. Is the company policy on chemical testing of body fluids applied consistently and with due care taken to safeguard the integrity of the fluid samples collected?
13. Have provisions been established for performing reliable chemical testing when appropriate?

or emotional upset?").

Policies for supervisor action should also be established. Steps are outlined in the guidebook. For example, if the supervisor observes the sale, use or possession of illegal drugs, action should be immediate. Individuals should be questioned separately. Witnesses, including those from the union, should be invited to be present during the questioning.

Employee assistance programs, though, play a key role in effective alcohol abuse programs and policy.

As the guidebook explains, "The availability of rehabilitation assistance to individuals who need it can substantially strengthen such a program."

No one—at any level—is immune. But despite the telltale signs of substance abuse, an employee may deny that he or she has a problem. What should a supervisor do?

Smoking the dried leaves and flowers of the marijuana plant, Cannabis sativa, brings euphoria.

Essentially, the EAP is a referral mechanism, so that valued employees can be given help.

One of the oldest programs is at Potomac Electric Power Company, Washington, D.C. PEPCO's Employee Advisory Service started in May 1976 with the backing of the company's chairman, W. Reid Thompson, according to Robert McKinley, coordinator of the program.

McKinley, who counsels and refers employees to appropriate treatment resources in the community, explained that the service is a "broadbrush" employee assistance program designed to advise employees whose personal problems have an adverse impact on their job performance. These problems could include not only substance abuse, but marital, emotional, financial, and other problems as well. Organizationally, it is a function of the company's medical department, which is part of the human resources group.

At Nevada Power, the program is small, due to the relatively small workforce of 1,367 employees. Says Lewis, "We have several agencies available locally, and our employees are briefed on their services. Employees are free to go to one of

these agencies or to select another one of their choice."

Many EAPs are already into midlife. At Pacific Gas and Electric Company, for example, the focus recently has been on the educational component. Like most, the PGandE program is a "comprehensive, prevention-minded" system, explains Dr. Joe Mattox.

Central to its operation is a three-phase educational program. The first phase concentrates on training supervisors. The objectives include "increasing the awareness of supervisors that work performance may reflect drug abuse," Dr. Mattox explains. The important signs are absenteeism, a high accident rate, and, interestingly, mushrooming grievances. Also part of the first phase is ensuring that supervisors understand their role.

"What is critical here is that some supervisors might be afraid of approaching a person they suspect has a drug problem," Dr. Mattox says.

To overcome that fear, he has organized practice sessions. "We do role playing. That way, supervisors go through the motions and see what it feels like to say, 'I think you have a problem.'"

The four hour workshops include plenty of details and plenty of practice, he says.

In the second phase, the psychologist focuses on employee education training. This includes an overview of significant drugs—heroin, cocaine, PCP (phencyclidine), as well as alcohol—and how they affect job performance.

Different drugs manifest different symptoms, Dr. Mattox says. "A person on cocaine might actually increase his activity—work longer hours, do more and more. But after a period of time, he may crash." Marijuana smokers and alcohol drinkers generally have higher absentee rates. No one is immune; a company's most valued employees—at any level—may succumb to drugs or drink in the face of personal problems and start to go downhill

But it is important, Dr. Mattox stresses, that supervisors not become diagnosticians. "If a supervisor has a question about drug abuse, he or she should involve a doctor." At the same time, "it is the responsibility of the employee to prove he or she is fit for duty. Employees must maintain responsibility for their own work performance."

In the third phase, Dr. Mattox has fashioned a program to "train the trainer."

"We have 28,000 employees. With an employee assistance program with nine counselors, we needed to have a training system."

At PGandE, the EAP has been coupled with the firm's safety department.

The most recent addition to the PGandE program is a pre-employment drug screen. Any applicant for employment goes through a physical that includes a urinalysis. The applicant is informed of the purpose for the test, Dr. Mattox says.

In addition to the drug screen,

PGandE's concern is reflected in its company-wide policy on substance abuse and a broadscale EAP which includes not only educational efforts but also assistance in addressing a whole host of problems. Counselors can deal with drug and alcohol problems as well as family, financial, psychological, and job-related stresses.

Because of the relative youth of assistance programs, evidence is sketchy regarding their success. According to a report of the Department of Health, Education, and Welfare (HEW), "the few company programs that are considered to be successful have achieved an effectiveness rate of 50 to 70 percent of employees who receive treatment for substance abuse."[7]

"We have a success rate of about seven out of ten," says McKinley of Potomac Electric Power Company.

Reports PGandE's Dr. Mattox, "Generally speaking, we have seen an increase in the number of people asking for help before it has become a work problem. Some 80 percent are self-referrals."

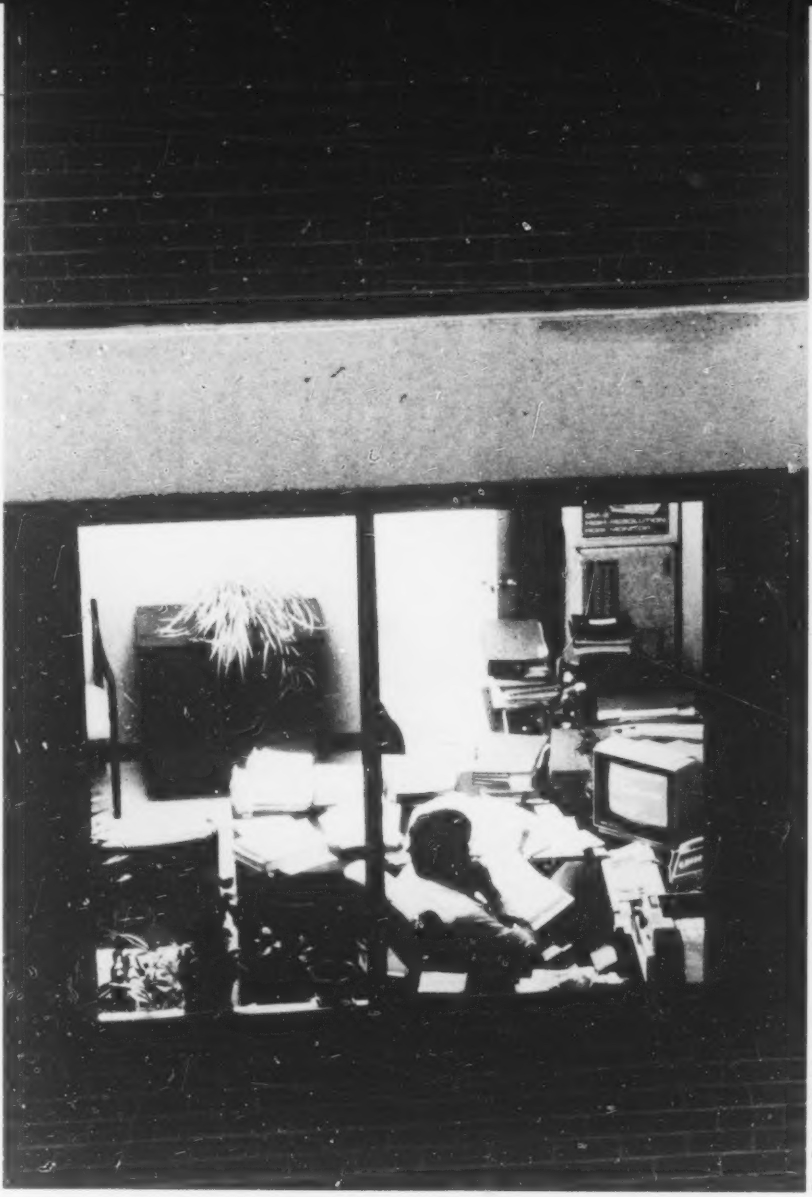
At Nevada Power, Lewis says, "We follow up on people who go through a program to ensure that they stay free of drinking or drugs. We estimate that approximately 65 percent never do alcohol or drugs again."

Some EAP coordinators report less success.

The factors of success? Writes Terry R. McGuirk in *Alcohol, Health and Research World,* "Among the major components . . . are labor and management cooperation in arriving at an acceptable policy, the training of supervisors in program methodology, the availability of treatment, and adequate referral services and evaluation techniques.

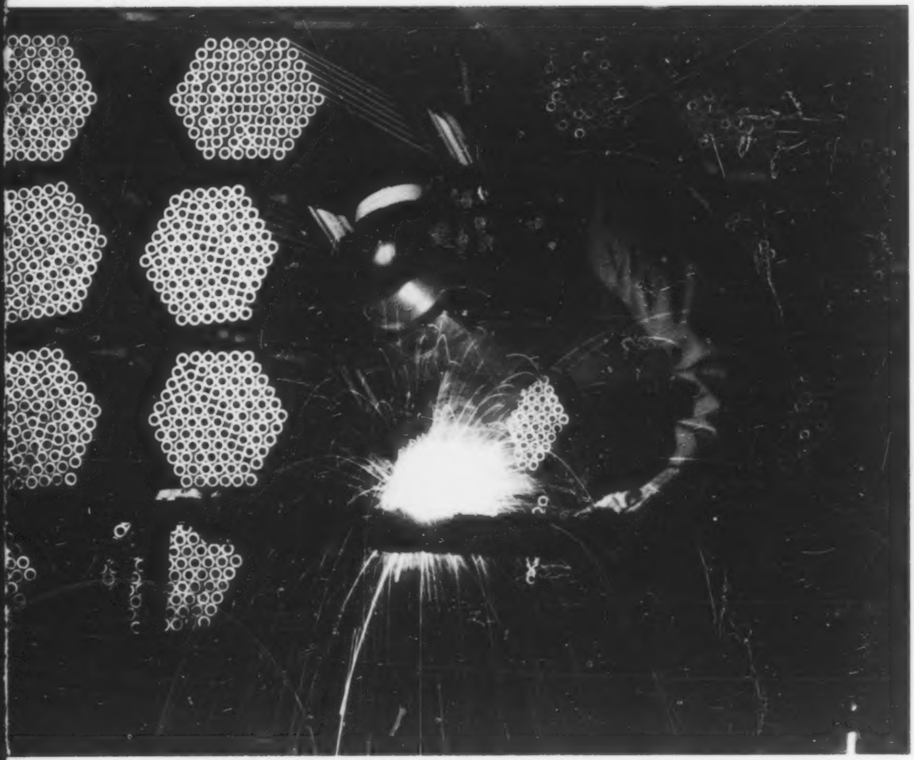
"The type of program used most often by these companies is the 'broadbrush' employee assistance program, in which it is stressed that a wide range of employee troubles, not just alcoholism or other drug abuse, are treated. The emphasis on problems *per se,* it is hoped, will allow employees to enter the program without the stigma so often associated with alcoholism and other drug abuse. An employee whose job performance has slipped below acceptable standards is referred to the program for assessment, diagnosis or assistance, after the supervisor has documented the employee's work performance, taking care not to pass moral judgment or to attempt diagnosis. The employee is confronted with the unsatisfactory job performance record and encouraged to take the recommended corrective action. If the employee repeatedly refuses to accept assistance, with no improved job performance, he or she is cautioned that disciplinary action will commence that will result in job termination. At this junction, most employees will be amenable to assistance."[8]

Understandably, construction of an employee assistance program begs several ethical questions touching on confidentiality, the "right" of treatment, and possible



Stacy Pick/Uniphoto

Some workers find that snorting cocaine makes them more productive and able to work longer hours . . . until they crash.



Jon Riley/Folio, Inc.

Alcoholics and drug addicts are more accident-prone. They have more medical bills and disability claims; they cause more damage to equipment and facilities; they endanger their co-workers.

conflicts of interest in therapeutic goals.

As for conflicts, researcher Jacob I. Melamed points to situations where the responsibility for the program is awarded to an outside contractor. "Covert organizational expectations may create a potential for conflict," he wrote in an HEW publication.[9] "Desire to insure renewal of the contract may influence the contractor to appear especially 'effective' in resolving situations involving management-referred troubled employees. The pressure to provide 'results,' to accede to implied, unstated demands by the organization that the contractor 'take care of' its troubled employees, can result in conflicts of interest similar to those of in-house occupational programs."

And what about the "right" to treatment? Since denial is a widely recognized symptom of alcoholism and drug abuse, how does this enter into an employee's right not to receive treatment? It is common in occupational programs to confront the drug abuser with possible job action as a means of countermanding that denial. At what point does coercion become interference with personal rights?

Employee confidentiality is vulnerable. The most common violation is through the release of information by the occupational program counselor. An increased awareness and constant vigilance on the part of the counselor as to what information must actually be disclosed can minimize this source of intrusion on the employee's expectation of confidentiality.

These problems aside, researchers are generally optimistic about controlling substance abuse. Former space program advisor Dr. Berry conveys to corporate managers a message they may pass on to their employees: "In today's frustrating and stress-producing world, where it seems we can't control very much, we can do much to control our own health. These efforts are greatly aided by well-conceived and carefully executed programs in the worksite, and thus help companies reduce overall health care costs."[10]

As the EEI guide notes, employees are a company's most valuable resource. Maintaining a substance-free workplace is in everyone's best interest. EP

Notes

1. "Taking Drugs on the Job," *Newsweek*, August 22, 1983, p. 52.

2. Steven Flax, "The Executive Addict," *Fortune*, June 24, 1985, p. 24.

3. *Newsweek*, p. 54.

4. Joan O'Connell and Bob Arnold, "Companies Are Starting to Sniff Out Cocaine Users," *Business Week*, February 18, 1985, p. 37.

5. Dr. Charles A. Berry, "An Approach to Good Health for Employees and Reduced Health Care Costs for Industry," National Institutes of Health, pamphlet, no date.

6. J. Michael Swint and David R. Larson, "Employee Assistance Programs: Incentives for Increasing State and Local Support," *Alcohol, Health, and Research World*, U.S. Department of Health and Human Services, Winter 1983/84, p. 35.

7. Terry R. McGuirk, "Evaluation and Development of Employee Assistance Programs," *Alcohol, Health, and Research World*, U.S. Department of Health, Education, and Welfare, Spring 1980, p. 17.

8. *Ibid.*

9. Jacob I. Melamed, "Ethical Issues in Occupational Programs," *Alcohol, Health, and Research World*, U.S. Department of Health, Education, and Welfare, Spring 1980, p. 39.

10. Dr. Charles A. Berry, "An Approach to Good Health for Employees and Reduced Health Care Costs for Industry."

William A. Kucharski and William R. Weissman

The New Law on Leaking Underground Storage Tanks

Electric utilities own more than 15,000 tanks that will cost plenty to test, repair or replace, but the alternative could cost even more.

In 1984, while public attention focused on Congressional efforts to reauthorize and expand the nation's hazardous waste and Superfund regulatory programs, a little-noticed new regulatory program concerned with leaking underground storage tanks became law. What was unusual about this legislation is that few environmental organizations pushed for its enactment; indeed, despite the potentially high cost of compliance, it generated little or no opposition from the industries likely to be most affected.

The momentum for enacting the legislation came almost entirely from local incidents of groundwater contamination stemming from leaking underground tanks in the districts of key members of Congress who serve on the committees responsible for environmental legislation. The principal sponsors were not members usually associated with legislative activism on environmental issues; the chief sponsors were Senator David Durenberger (R-Minn.) and Representative Donald L. Ritter (R-Pa.), mainstream Republicans on regulatory matters.

Until this time, the prevailing attitude toward underground tanks had been "out of sight, out of mind." However, repeated incidents of leaks from underground tanks—a great many of them involving gasoline at retail service stations—provided strong evidence of a significant threat to the nation's groundwater resources. With little evidence of the magnitude or cost of preventive or corrective action, but alarmed by this growing risk to underground drinking water sources, Congress adopted a far-reaching program to regulate not merely gasoline service station tanks, but the more than three million underground tanks thought to exist nationwide.

The program was added as a rider to the 1984 reauthorization of the Resource Conservation and Recovery Act (RCRA), the statute under which most hazardous and solid wastes are regulated at the federal level. With no fanfare or public ceremony, President Reagan signed the bill into law on November 8, 1984. Despite the inevitable jokes, the Leaking Underground Storage Tank program has been dubbed by the Environmental Protection Agency (EPA) as the LUST program.* Electric utilities, which own more than 15,000 tanks, will soon discover, if they have not already, that even though underground tanks continue to be "out of sight," these tanks will be very much on the minds of utility management as they face significant capital expenditures and possibly costly cleanup requirements under the new LUST program.

Electric Utility Tanks

The petroleum and chemical manufacturing industries are the major owners and operators of regulated underground tanks. Electric utilities and utility industry affiliates, such as natural gas and telecommunications operations, also are major users of underground storage tanks. While most utility industry tanks are below 25,000 gallons in size, some utilities—particularly those with oil-fired power plants—have extremely large tanks that exceed 100,000 gallons capacity. The industry uses its tanks primarily to store petroleum products, though a small percentage stores a variety of other substances, some of which are regulated as hazardous under RCRA or the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, or Superfund). The majority of utility underground tanks are found at distribution and service centers, set up much like retail gasoline service stations. Relatively few underground tanks are located at generation facilities.

WILLIAM A. KUCHARSKI is Manager of Environmental Engineering for Pacific Power & Light Company and Chairman of the Utility Solid Waste Activities Group's Leaking Underground Storage Tank Committee. WILLIAM R. WEISSMAN, a partner with the Washington, D.C., firm of Wald, Harkrader & Ross, is counsel to that committee.

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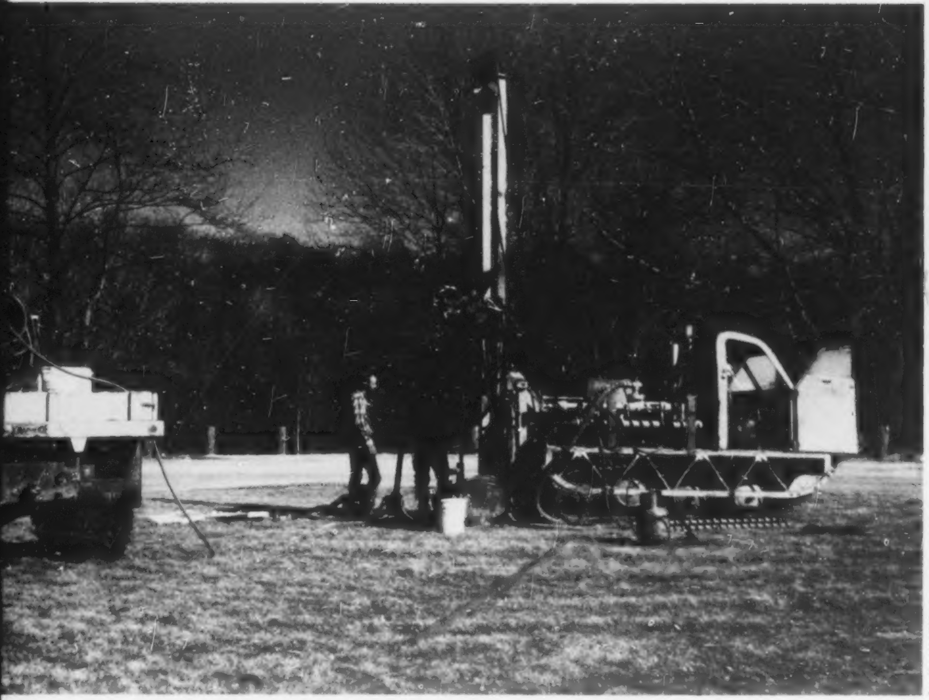
*The LUST acronym has been widely accepted in the governmental and industrial communities, and, accordingly, it is used in this article. However, shortly before this magazine went to press, EPA renamed the program the "Underground Storage Tank" or UST program. It remains to be seen whether the new name will catch on beyond EPA.

Even a hole leaking as little as one gallon of gasoline per day can contaminate the water supply for a city of 50,000.



Northeast Utilities

Northeast Utilities

Northeast Utilities, headquartered in Hartford, Connecticut, launched a management program for its 400 underground tanks in 1984. A groundwater monitoring well is drilled at one service center where a gasoline tank was found to be leaking.

Above, right:
An environmental technician with Northeast Utilities (NU) measures groundwater levels.

The Utility Data Institute conducted a nationwide survey of the industry's underground tanks in 1984 for Edison Electric Institute's Groundwater Task Force. The survey confirmed that utilities own a large number of tanks—the average number per utility was 63, but 200 or more tanks per utility was not uncommon. The survey also revealed that a vast percentage of the tank population is more than five years old; indeed, nearly 40 percent of the tanks are over 15 years old. While most tanks (85 percent) are made of steel, the owners of more than half of the tank population reported no corrosion protection, and nearly three-quarters reported no leak detection or testing devices.

The High Cost of Groundwater Contamination

At the time Congress enacted the LUST program, it assumed that the nationwide population of underground tanks was two million (current estimates are far higher). Based on the two-million-tank estimate, Congress accepted estimates that as many as 75,000 to 100,000 underground tanks (under 5 percent) may now be leaking and that 350,000 tanks may leak within five years.* More recent sources estimate that from 10 to 30 percent of underground tanks may be leaking today. Whatever the correct figures, there is little doubt that a large number of tanks are leaking, many more soon will leak, and the danger to the nation's groundwater resources and subsurface environment from such leaks is significant. A leak of one gallon per day, according to EPA, can contaminate the water supply for a city of 50,000. Data do not indicate any correlation between size of tank, size of leak, and environmental impact. It is evident, however, that a small leak from a small tank can cause significant environmental damage. EPA has already listed more than a dozen leaking tank sites on the National Priority List for cleanup under the Superfund program.

The potential liability facing a company with a leaking underground tank can be very high, especially if groundwater has been contaminated. For instance, one Silicon Valley electronics manufacturer had a waste solvent tank which was four years old when it began leaking. It leaked a total of 56,000 gallons during an 18-month period. The solvents traveled through the soil and affected three aquifers. So far, the company has sunk more than 70 wells, has removed the tank and the surrounding soil, and reportedly has spent $12 million. At a Long Island service station site, the claims that followed the discovery of a leaking gasoline tank have totalled more than $2 billion. While the ultimate extent of liability may prove to be significantly below this extraordinary figure, the cost of cleaning up environmental damage to groundwater and subsurface environment nevertheless is usually quite high.

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*H.R. Conf. Rep. No. 98-1133, 98th Cong., 2d Sess. at 128 (1984).

While there is no definitive evidence of leaks in a high proportion of tanks owned by utilities, there is cause for concern because a large percentage of these tanks were installed years ago without state-of-the-art protection against corrosion and leakage. One eastern utility recently investigated its gasoline tanks and found them to be leaking considerably less than the national leak estimate, despite the fact that its own tanks generally were slightly older than the national average. But even if this more favorable experience is typical of the industry as a whole, the industry still could face massive cleanup expenditures because site cleanups can easily cost millions of dollars, depending on the extent of contamination and other site-specific factors. If utility tanks turn out to be typical of tanks nationwide, and if estimates that 10 to 30 percent of underground tanks may be or soon will be leaking, total utility industry liabilities theoretically could reach the billions of dollars level.

The Legislative Requirements

The new LUST legislation has three major aims: (1) to conduct a census of all existing underground tanks, (2) to formulate design standards for new tanks, and (3) to establish basic operating standards for all tanks which will prevent and detect leaks and require corrective action where needed. Like other recent federal environmental statutes, LUST requires minimum federal standards to be promulgated by EPA, but the states may acquire primary enforcement responsibility if they adopt a regulatory program no less stringent than the EPA program. EPA, however, retains broad authority to bring civil and administrative enforcement actions, including the authority to impose daily $10,000 per tank civil penalties for regulatory violations. Unlike its action on the other statutes, however, Congress declined to require that a permit program for tanks be established.

One part of the legislation has already gone into effect. As of May 8, 1985, installation of bare steel tanks for storing regulated substances is prohibited (except in dry areas with high resistivity soil) unless the tank meets stringent cathodic protection standards, is designed to prevent leaks during its operational life, and has a wall or lining that is compatible with the

To test its tanks, NU contracted with Hunter Environmental Services of Malvern, Pennsylvania. Hunter deployed two-person teams with specially equipped vans to perform tests and analyze the results. No excavation was necessary.

Hunter Environmental Services

leak lokator

The Alexander Company

A team manager reviews a strip chart that shows weight fluctuations detected by Hunter's "Leak Lokator" system. Line patterns on the chart can reveal leaks smaller than 5/100ths of a gallon per hour.

substance to be stored. This prohibition will automatically expire whenever EPA implements new tank performance standards.

A one-time nationwide census of existing underground tanks covered by the statute is to occur by May 8, 1986, when owners of such tanks must file a notification form with the state in which each tank is located. The form requires information about the age, size, type, and location of each tank still in service. Any underground tank taken out of service since January 1, 1974, unless it has been removed from the ground, also must be reported. The notification is to be filed solely with the state, not with EPA. If the tank was taken out of service and sold prior to November 8, 1984, the seller (not the current tank owner) must file the notification. Tanks installed after May 8, 1986, must be reported to the state within 30 days of installation. The states are free to expand on the inquiries on the federal form if they choose.

A threshold question facing tank owners is whether their tanks are covered by the statute and hence must be reported to the states. Many above-ground tanks, in fact, will be regulated as underground tanks under the LUST program because the legislation broadly defines an underground storage tank to include installations where 10 percent or more of the volume of the tank and its connecting pipes is underground. Thus, if the volume of underground piping is high enough, an above-ground tank becomes subject to the program. In addition, the tank also must be used to store a "regulated substance"—that is, petroleum products or hazardous substances covered by the Superfund statute. Tanks containing hazardous wastes covered by the RCRA permit requirement are excluded from the LUST program.

Even if a tank meets the "underground" volume standard and contains a "regulated substance," it still may be exempt. The statute expressly excludes certain small farm and residential tanks, heating oil tanks, septic tanks, regulated pipelines, waste water and storm water collection systems, surface impoundments, flow-through process tanks, and tanks placed above floor level in underground areas. However, many questions still remain unanswered. How will the definition of "tank" be applied to structures such as sumps? What constitutes a flow-through process system? EPA will have to answer these and many other questions before the regulatory impact of the program on the utility industry can be fully gauged.

Another important feature of the legislation requires EPA to issue regulatory standards for new

A hydrogeologist at NU samples effluent from the carbon filtration system at a discharge outlet to a storm sewer.

and existing tanks according to a staggered schedule during 1987 and 1988. EPA's present plan, however, is to issue these regulations in a single package by February 1987.

The legislation states the applicable regulatory standard in a general way—the regulations must "protect human health and the environment"—and delegates broad discretion to EPA to formulate the precise requirements within that general standard. In addition, the regulations for new tanks must include standards for design, construction, installation, release detection, and compatibility. The regulations for existing tanks must include requirements for leak detection systems (the statute suggests a combination of an inventory control system and tank testing), recordkeeping and reporting requirements, corrective action requirements, and tank closure standards. EPA also may require tank owners to provide evidence of financial responsibility for taking corrective action or compensating third party victims of any tank releases. Because of the lag in implementing corrective action regulations for petroleum releases from underground tanks (the Superfund already covers releases of hazardous substances but does not cover petroleum releases), Congress is considering an amendment to the LUST statute to require EPA to undertake immediate corrective action, if necessary, using funds to be earmarked for this purpose from the existing Superfund.

Congress has committed EPA to an extremely ambitious regulatory agenda in a short period of time. The timetable imposed by statute leaves EPA very little time to answer some extremely difficult regulatory questions:

- Should the regulatory standards for all tanks be uniform, or should they take account of site-specific variables such as climate, soil, and hydrogeology?
- To what extent should economics or financial burden affect the standards to be promulgated? One utility reported budgeting approximately $10 million to comply with far-reaching state-imposed tank requirements.
- Should existing steel tanks be required to retrofit with cathodic protection to minimize the risk of corrosion?
- Should secondary containment be mandatory for all tanks? This could include a double-walled tank, an external liner or a vault.
- What leak detection methodology should be prescribed? Inventory controls? In-the-tank monitoring devices? Should soil or groundwater monitoring be required? The latter could impose an annual cost of over $2,500 per tank.
- Should old tanks be subject to mandatory retirement even in the absence of detected leakage? Should they be subject to more frequent tank testing?
- Before returning a leaking tank to service, should it be upgraded to meet new tank standards in addition to being repaired?
- Should removal from the ground and soil decontamination be required for all tanks permanently removed from service? If not, should groundwater monitoring be required for a prescribed post-closure period?

EPA tentatively answered some of these questions as they would apply to tanks subject to the RCRA hazardous waste permit program. In proposed hazardous waste tank regulations published recently, EPA suggested, among other things, (1) a requirement for secondary containment for all new tanks, (2) an option for existing underground tanks either of installing secondary containment or, alternatively, of conducting groundwater monitoring and semi-annual tank testing (aboveground portions of tanks would be required to have partial secondary containment in either case); (3) mandatory corrosion protection for new tanks; (4) removal of the tank and ancillary equipment at closure and decontamination of any contaminated soil or compliance with post-closure groundwater monitoring standards applicable to hazardous waste landfills; and (5) engineer certification of proper tank installation. Although EPA cautions that these proposed hazardous waste regulations should not be considered a harbinger of its future LUST program regulations, they nevertheless provide a model which EPA may find irresistible as the statutory deadline for publishing the LUST regulations approaches.

State Programs

A number of states already have enacted their own programs to regulate underground storage tanks. New York, Connecticut, Florida, and California, for example, have extensive regulatory programs that go far beyond EPA's current approach. The California program, in particular, has imposed substantial burdens on tank owners by setting action-forcing deadlines and has divided responsibility between many different state and local authorities. One California company, for example, has had to deal with over 50 separate government agencies.

Most of the state programs are not as complicated or burdensome as those mentioned above. Many state regulatory programs are aimed principally at fire or explosion hazards of underground tanks and are modeled on National Fire Protection Association Code 30 standards. These state programs will have to be expanded to meet EPA LUST standards if enforcement of the federal program is to be delegated to those states.

History has shown that many underground systems leak and that such leaks can have a catastrophic impact on drinking water resources.

Industry Response

As soon as the new legislation was enacted, the petroleum, chemical, and utility industries took an active interest in the implementation of the new program. The American Petroleum Institute (API) has been particularly visible in alerting government, industry, and citizens' groups to the implications of the new law and proper installation and management techniques for underground storage tanks. API generally has shared its research with other industries to reduce the risk of leakage.

Because the LUST regulations will significantly impact electric utilities, the industry mobilized quickly to monitor EPA activities in this area and to present the industry's view on how to implement the environmental aims of the statute in a cost-efficient manner. Primary responsibility for the LUST program within the industry was assigned to the Utility Solid Waste Activities Group (USWAG), the ad hoc utility group that has been responsible for the industry's RCRA regulatory activities. The EPA staff responsible for formulating LUST regulations is the same staff that recently worked with USWAG and the industry in connection with EPA's study of utilities' fossil fuel combustion byproducts. That staff has welcomed the industry's suggestions on formulating sound regulations to implement the program. In short, the working relationship between EPA and the electric utility industry on LUST issues is "off to a running start."

A "LUST Committee" was promptly organized within USWAG, and approximately 25 utili-

Hunter tester drops a probe into a tank's fill pipe to monitor temperature changes that can affect liquid volume. The probe is connected to the strip chart recorder inside the van.

VIRONMENTAL
TING SERVI

Northeast Utilities

An NU chemist examines effluent samples for hydrocarbon content.

ties from around the country thus far have assigned representatives to that committee. Representatives from additional utilities are welcome to join the committee. Two working task forces were established among committee members—one concerned with performance standards and the other with remedial action standards—and several important research projects have been undertaken. The Performance Standards Task Force is compiling evaluations of state-of-the-art tank and piping technology and installation practices and commercially available tank and pipe testing methodology. These data not only will assist the committee in preparing the industry's position on EPA's proposed regulations, but they also will be made available to USWAG member companies for their own tank installation and management programs.

The committee, in cooperation with the Electric Power Research Institute (EPRI), is developing a decision matrix with which individual utilities can assess the environmental risks posed by existing underground tanks and the available options for minimizing those risks.

Finally, the Remedial Action Task Force is actively developing a general response plan or decision framework to assist utilities in responding to a suspected leak. This plan will cover the sequence of events beginning with a suspected leak and ending with ultimate resolution of any tank failure either by removing the tank from service or by its repair and reinstatement of service. This response plan will be distributed within the industry and may be submitted to EPA to aid the agency in drafting practical and flexible corrective action regulations.

No More "Out of Sight, Out of Mind"

It is already evident that the fledgling LUST program could grow massively to a size that matches the RCRA hazardous and solid waste programs. No one yet knows precisely how many tanks will be affected by this program, but it is already clear that most projections have underestimated the number of tanks and the number of leaking incidents requiring some form of corrective action.

When Congress abandoned the old "out of sight, out of mind" attitude towards underground tanks and passed the LUST statute in 1984, it directed EPA to take a broad range of actions to prevent tank leaks and to clean up leaks that have occurred. History has shown that many underground systems leak and that such leaks can have a catastrophic impact on drinking water resources. Compliance with the new law will be costly; but the cost of remedying environmental damage usually is even higher. Given the utility industry's large and aging population of underground tanks, it is unlikely that utilities will escape the major burdens imposed by this program. By 1987 and 1988, the size of these burdens should become clearer. EP

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Contact one of our offices listed below. Or write to: Power Division, Stearns Catalytic Corporation, Box 5888, Denver, CO 80217.

Stearns Catalytic

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1	Exxon	25	Standard Oil (Ohio)	49	Consolidated Foods	73	American Home Prod	97	North American Philips
2	General Motors	26	AT&T Technologies	50	Lockheed	74	Litton Industries	98	Agway
3	Mobil	27	Boeing	51	Georgia Pacific	75	Hewlett Packard	99	Pfizer
4	Ford Motor	28	Dow Chemical	52	Monsanto	76	Control Data	100	H J Heinz
5	IBM	29	Allied	53	W R Grace	77	Texas Instruments	101	NCR
6	Texaco	30	Eastman Kodak	54	Signal Companies	78	LTV	102	Pillsbury
7	E I du Pont	31	Unocal	55	Anheuser Busch	79	American Brands	103	PPG Industries
8	Standard Oil (Ind)	32	Goodyear	56	Nabisco Brands	80	International Paper	104	Int Harvester
9	Standard Oil of Cal	33	Dart & Kraft	57	Johnson & Johnson	81	Motorola	105	American Motors
10	General Electric	34	Westinghouse Elec	58	Coastal	82	Burroughs	106	Borg Warner
11	Gulf Oil	35	Philip Morris	59	Raytheon	83	Archer Daniels Midland	107	American Cyanamid
12	Atlantic Richfield	36	Beatrice Foods	60	Honeywell	84	Digital Equipment	108	Kerr McGee
13	Shell Oil	37	Union Carbide	61	Charter	85	Borden	109	United Brands
14	Occidental Petroleum	38	Xerox	62	General Mills	86	Champion International	110	FMC
15	U S Steel	39	Amerada Hess	63	TRW	87	Armco	111	Emerson Electric
16	Phillips Petroleum	40	Union Pacific	64	Caterpillar Tractor	88	Esmark	112	Dresser Industries
17	Sun	41	General Foods	65	Aluminum Co of Amer	89	Diamond Shamrock	113	Boise Cascade
18	United Technologies	42	McDonnell Douglas	66	Sperry	90	CPC International	114	Warner Comm
19	Tenneco	43	Rockwell Int	67	Gulf & Western Ind	91	Time Inc	115	Owens Illinois
20	ITT	44	PepsiCo	68	Continental Group	92	Deere	116	Carnation
21	Chrysler	45	Ashland Oil	69	Bethlehem Steel	93	Bristol Myers	117	American Can
22	Procter & Gamble	46	General Dynamics	70	Weyerhaeuser	94	Martin Marietta	118	Reynolds Metals
23	R J Reynolds Ind	47	3M	71	Ralston Purina	95	Firestone Tire & Rubber	119	Campbell Soup
24	Getty Oil	48	Coca Cola	72	Colgate Palmolive	96	IC Industries	120	Kimberly-Clark

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While American business is trying to stay competitive with foreign companies, it's paying an added penalty. The penalty of double-digit illiteracy.

Believe it or not, 27 million American adults can't read and write. Another 47 million are literate on only the most minimal level. That adds up to almost one third of our entire population... and probably a disturbing number of *your* employees.

What does illiteracy cost you? Get out your calculator. Illiterate adults make up 50%-75% of our unemployed. Every year they cost us an estimated $237 billion in lost earnings. They swell our welfare costs by $6 billion annually and diminish our tax revenues by $8 billion.

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What can your company do about this? It can join in local efforts to fight illiteracy. It can volunteer company dollars and facilities for better school and tutorial programs. It can invest in a more literate community.

The first step is to call the Coalition for Literacy at **1-800-228-8813** or fill out the coupon below. Do it today. You may find it's the greatest cost-saving measure your company has ever taken.

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FINANCIAL REVIEW

1985 FIRST QUARTER EARNINGS PER SHARE UNCHANGED FROM PRIOR YEAR

The investor-owned electric utility industry earned 89 cents per share on electric operating revenues of $30.7 billion in the first quarter of 1985 (see Table 1). Earnings per share for the industry were flat for the second quarter in a row, on a 1.1 percent increase in electricity sales. Net income available for common was up to $4.9 billion, an increase of 7.2 percent. Average shares outstanding increased 8.3 percent, a slightly higher increase than the average gain of the past four quarters. This put downward pressure on earnings per share (net income available for common stock divided by the number of shares outstanding), which ended the first quarter unchanged from the first quarter of 1984.

A rise in total electric sales and the effects of rate increases contributed to the first quarter's 7.1 percent gain over electric operating revenues of the first quarter of 1984. For the twelve months ending March 31, 1985, operating revenues were $121.5 billion, an 8.9 percent increase.

Total electric operating expenses kept pace with revenues, rising 7.0 percent and 8.8 percent respectively, for the quarter and the year ended March 31, 1985. Expenses edged down slightly as a percentage of total electric operating revenues, from 80.9 percent for the first quarter of 1984 to 80.8 percent in 1985. Although some companies encountered higher fuel and purchased power expense and a decline in recoverable fuel cost, the industry's fuel cost during the first quarter increased only 3.5 percent compared to a 5.5 percent increase from 1983 to 1984. Scheduled outages for some utilities and severe winter storms in the Great Lakes region contributed to the 9.9 percent increase in operation and maintenance costs. Depreciation and amortization rose 12.1 percent as more plants were put into service.

Income taxes paid in the first quarter of the year were 25 percent higher than those paid in the same period of 1984, reflecting the industry's gain in pre-tax income. Accumulated deferred income taxes increased by over 48 percent. Several companies recognized abandonment losses on nuclear facilities and provided for the difference between tax and financial accounting, which contributed to the increase.

Other utility income was up only 6.7 percent to $782 million. Lower gas revenues resulted from lower average gas rates and a decrease in sales caused by milder winter weather in most parts of the country. Non-utility income continued to be strong, with a 21.2 percent increase over the period ended March 31, 1984.

The allowance for funds used during construction (AFUDC), which represents the cost of equity and borrowed funds used to finance construction, increased only 4 percent over total AFUDC in the first quarter of 1984 and only 2.7 percent for the twelve-month period. This was less than half of the 8.2 percent increase from March 31, 1983, to March 31, 1984. AFUDC dropped to 43.9 percent of net income available for common, compared to 45.3 percent in 1984. Construction work in progress (CWIP) increased less than a percent over the first quarter of 1984. That caused a decline in the ratio of CWIP to plant in service, from 51.6 percent for the previous year to 45.9 percent.

Looking at the balance sheet for a snapshot of the industry's financial condition on March 31, 1985, we see that assets increased 10.4 percent over the first quarter of 1984, to $389 billion (see Table 2). Total capitalization reached $300.5 billion, a 7.9 percent gain. The 16.3 percent increase in retained earnings was reflected in the industry's 41.3 percent equity ratio. Common stock equity as a percent of total capitalization was only 40.5 percent a year ago. Preferred stock as a percent of total capitalization fell to 10.6 percent from 11.5 percent. Long-term debt rose to 48.1 percent from 48.0 percent at March 31, 1984. The return on average common equity was 14.6 percent.

Interest expense on long-term debt rose 10.2 percent to $3.6 billion, while other interest expense fell 5.8 percent. Pre-tax interest coverage for the quarter (including AFUDC) dipped slightly to 3.23 times compared to 3.27 times in 1984. The coverage ratio of 3.08 times for the twelve months ending March 31, 1985, is only marginally lower than the 3.09 times at the end of 1984.

Common stock dividends were flat for the quarter and showed only a 1.3 percent increase for the twelve months ending March 31, 1985. The dividend payout ratio of 60.1 percent compares to 59.5 percent for the first quarter of 1984. Several companies with financial difficulties omitted or reduced dividends for the first quarter as they did in the last quarter of 1984. Excluding these companies from our sample, dividends per share increased 4.4 percent and 5.8 percent for the quarter and the twelve-month period, respectively. This growth rate is more indicative of the portion of the industry paying dividends.

Contributed by the Finance and Regulation Department of Edison Electric Institute.

Table 1

INVESTOR-OWNED ELECTRIC UTILITY INDUSTRY STATEMENT OF INCOME

(Unaudited)
(Millions of dollars)

	Three Months Ending March 31,			Twelve Months Ending March 31,		
	1985	1984	% Change	1985	1984	% Change
Total Electric Operating Revenues	$30,660	$28,618	7.1	$121,521	$111,572	8.9
Electric Operating Expenses						
Fuel	$ 9,254	$ 8,940	3.5	$ 37,812	$ 36,152	4.6
Other Operation & Maintenance	7,795	7,092	9.9	30,683	27,256	12.6
Depreciation & Amortization	2,472	2,206	12.1	9,495	8,417	12.8
Taxes Other Than Income Taxes	2,263	2,137	5.9	8,663	8,032	7.9
Income Taxes (Federal & Other)	1,274	1,019	25.0	4,741	3,614	31.2
Provision for Deferred Income Taxes	956	1,016	(5.9)	4,866	4,898	(0.7)
Investment Tax Credit Adjustment, Net	772	751	2.8	2,001	1,923	4.1
Total Electric Operating Expenses	$24,786	$23,161	7.0	$ 98,261	$ 90,292	8.8
Electric Operating Income	$ 5,874	$ 5,457	7.6	$ 23,260	$ 21,280	9.3
Other Utility Operating Income	782	733	6.7	1,531	1,394	9.8
Total Utility Operating Income	$ 6,656	$ 6,190	7.5	$ 24,791	$ 22,674	9.3
Other Income	715	590	21.2	2,204	1,875	17.5
Allowance for Other Funds Used During Construction	1,341	1,274	5.3	5,292	5,138	3.0
Total Income Before Interest Charges	$ 8,712	$ 8,054	8.2	$ 32,287	$ 29,687	8.8
Interest Charges						
Interest on Long Term Debt	$ 3,621	$ 3,286	10.2	$ 14,124	$ 12,744	10.8
Other Interest Expenses & Charges	259	275	(5.8)	1,164	1,146	1.6
Allowance for Borrowed Funds Used During Construction	(820)	(804)	2.0	(3,263)	(3,189)	2.3
Net Interest Expenses & Charges	$ 3,060	$ 2,757	11.0	$ 12,025	$ 10,701	12.4
Net Income Before Extraordinary Items	$ 5,652	$ 5,297	6.7	$ 20,262	$ 18,986	6.7
Extraordinary Items	0	18	(100.0)	(34)	(258)	(86.8)
Net Income	$ 5,652	$ 5,315	6.3	$ 20,228	$ 18,728	8.0
Preferred Dividends Declared	732	726	0.8	2,926	2,836	3.2
Net Income Available for Common	$ 4,920	$ 4,589	7.2	$ 17,302	$ 15,892	8.9
Common Dividends Declared	2,955	2,731	8.2	11,313	10,523	7.5
Additions to Retained Earnings	$ 1,965	$ 1,858	5.8	$ 5,989	$ 5,369	11.5
Avg. Shares Outstanding	5,558	5,134	8.3	5,331	5,025	6.1
Earnings Per Share*	$ 0.89	$ 0.89	0.0	$ 3.25	$ 3.16	2.6
Common Dividends Per Share*	$ 0.53	$ 0.53	0.0	$ 2.12	$ 2.09	1.3

*Based on average shares outstanding as reported to EEI by survey respondents and adjusted for stock splits.
NOTE: Revenues are adjusted for intra-industry sales for resale of electricity.

Based on unaudited reports submitted by a sample of electric utilities representing approximately 94 percent of the industry's revenues from sales to ultimate customers and 93 percent of the industry's total assets. Data expanded to represent the entire investor-owned electric utility industry.

Table 2
INVESTOR-OWNED ELECTRIC UTILITY INDUSTRY BALANCE SHEET
As of March 31, 1985
(Unaudited)
(Millions of dollars)

Assets	**1985**	**1984**	**% Change**
Utility Plant*			
Utility Plant (Including Nuclear Fuel)	$310,450	$276,401	12.3
Less Accumulated Depreciation	88,129	79,784	10.5
Total	$222,321	$196,617	13.1
Construction Work in Progress	101,950	101,450	0.5
Net Utility Plant	$324,271	$298,067	8.8
Investments	8,077	6,748	19.7
Current Assets	37,905	34,350	10.3
Deferred Debits	18,979	13,420	41.4
Total Assets	$389,232	$352,585	10.4
Capitalization & Liabilities			
Capitalization			
Common Stock	$ 81,038	$ 75,732	7.0
Retained Earnings	43,190	37,128	16.3
Preferred Stock	31,775	31,960	-0.6
Long-Term Debt	144,574	133,644	8.2
Total Capitalization	$300,577	$278,464	7.9
Current Liabilities			
Short-Term Debt	$ 4,562	$ 4,779	(4.5)
Long-Term Debt Due Currently	4,081	4,075	0.1
Other Current Liabilities	28,889	26,678	8.3
Total Current Liabilities	$ 37,532	$ 35,532	5.6
Deferred Credits			
Accumulated Deferred Income Taxes	$ 28,779	$ 19,378	48.5
Accumulated Deferred Investment Tax Credits	14,511	12,855	12.9
Other Deferred Credits	7,833	6,356	23.2
Total Deferred Credits	$ 51,123	$ 38,589	32.5
Total Capitalization & Liabilities	$389,232	$352,585	10.4

*Includes other utility plant of combination gas and electric companies.

Based on unaudited reports submitted by a sample of electric utilities representing approximately 94 percent of the industry's revenues from sales to ultimate customers and 93 percent of the industry's total assets. Data expanded to represent the entire investor-owned electric utility industry.

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Our monogram. Our telephone number.

When you call, you won't reach a switchboard. Or an answering service that'll simply shuttle your name to a salesperson.

You'll reach handpicked, front line experienced General Electric managers and professionals. They're the program directors at the GE Business Information Center.

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TECHNOLOGY REVIEW

GENERAL MOTORS ELECTRIC VAN PROJECT

The Electric Vehicle Development Corporation (EVDC) of Cupertino, California, has established a plan for and is managing a joint project to introduce electric vans into the commercial fleet vehicle market.

Called the General Motors Electric Van Market Application Development Project, the effort involves General Motors Corporation (GM), Bedford Commercial Vehicles, Lucas Chloride EV Systems (LCEVS), the Tennessee Valley Authority (TVA), Detroit Edison Company, and the Electric Power Research Institute (EPRI) working together with EVDC in support of the operation of GM electric vans within utility and non-utility service fleets. This project is designed to provide the necessary ingredients for achieving EVDC's near-term electric vehicle (EV) commercialization objective—the introduction of a market-acceptable electric van for use within commercial service fleets during the late 1980s.

The GM Electric Van Market Application Development Project consists of four interrelated phases that allow for the gradual evolution of the technology, its market, and its support systems. The GM electric van was selected for this project because of its performance capabilities and proven reliability, as well as the manufacturers' commitment to develop the necessary vehicle support systems.

The vehicle infrastructure systems and initial market developed in support of the introduction of the GM van will serve as the foundation for future market expansion. As other electric vehicles that can meet market requirements become available, they will benefit from the experience gained from this first project.

The emphasis on electric vans and commercial fleets as the most desirable initial technology and market targets follows from the results of a national market study, *Electric Vehicles in Commercial Sector Applications*, July 1984, funded by EPRI and conducted by Detroit Edison Company and the University of Michigan. By nature, fleet operations—with their restrictive daily vehicle usage and centralized storage and servicing, and with the importance of life cycle costs in vehicle purchase decision making—are more compatible with near-term EV technology capabilities than are personal use applications. The market potential for electric vans is significant. An estimated 2.4 million vans are currently in use in commercial fleets.

Achieving the overall objective of the GM Electric Van Market Application Development Project will require:

- Demonstrating the suitability and reliability of electric vans in fleet applications.
- Substantiating the potential cost competitiveness of EVs.
- Establishing model EV service and support systems.
- Identifying effective marketing methods and user incentives.
- Transferring Bedford and LCEVS technology to the United States.
- Dispelling existing negative perceptions regarding EVs and their long-term potential.

To minimize the risks associated with such an ambitious undertaking, the project has been divided into four phases:

Phase 1: Van Acceptance Testing
Phase 2: Field Evaluation and Infrastructure Development
Phase 3: Van Deployment
Phase 4: Technology Transfer for U.S. Market

The project was initiated in September 1984 and current plans call for its continued operation through December 1988. Phase 1, Van Acceptance Testing, has been successfully completed, and the fleets participating in the Phase 2 Field Evaluation and Infrastructure Development will begin the operation of some 30 electric vans in July and August 1985. Seven electric utilities are participating in Phase 2:

Detroit Edison Company
Florida Power Corporation
Hydro Quebec
Public Service Company of New Mexico
San Diego Gas and Electric
Southern Company Services
Tennessee Valley Authority

Phase 3, which is scheduled to begin in July 1986, will involve the expansion of the vehicle service and support systems established in Phase 3. The final stage of the project, Phase 4, is scheduled to begin in July 1987.

A key aspect of this project is the establishment of the necessary EV infrastructure system to support the operation and maintenance of the vans. GM, Bedford, and LCEVS are working together to develop vehicle service and support systems.

If is a four-letter word.

It's tough to take the *risk* out of *if*.

But a new idea in generating electric power can do that for electric utility executives.

If you're not sure what your future capacity ought to be, you should talk with General Electric. Just call our Business Information Center and ask about Progressive Generation or, as we call it, the GE PROGEN™ system.

Upfront, count on four major advantages.

Low capital requirements.

The ability to add capacity in small increments.

Short lead times.

And conversion to coal as a realistic alternative if gas and oil prices shoot up.

Say you need near-term capacity — and quickly. Highly reliable GE gas turbines meet the need. At just one-fifth the cost of a conventional plant burning coal. And they're on line in 12 months or less.

When your higher peak becomes the new base load demand? Add on steam turbines so you have a combined cycle plant. Efficiency bumps up 20%. And the cost advantage over a coal plant is a whopping 67%. Which means you could save up to $40 million per year.

Should your fuel prices go up substantially, you'll have the realistic option of adding on gasifiers so your combined cycle system can use coal.

All good reason to call (518) 438-6500 and ask about a GE PROGEN™ system.

No ifs, no ands, and no maybes.

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[illegible]

Table 1
Performance Test Results

Range	
SAE J227aC Cycle*	65 mi
Urban Driving	55 mi
Acceleration (0-30 mph)	
100% SOC**	11 sec
20% SOC	13 sec
Braking	
30-0 mph	51 ft.
50-0 mph	156 ft
Gradeability Limit	18%
Energy Use (J227aC)	0.8 kWh/m

*Society of Automotive Engineers Delivery Cycle
**State of Charge

Table 2
Life-Cycle Cost

Life-Cycle Cost (cents/mi)	Conventional Van	Electric Van 1985	Electric Van 1985/86	Electric Van 1986/87
Depreciation—Vehicle	11.2	17.7	15.6	13.6
—Battery	—	11.1	11.1	9.8
Fuel/Electricity	10.4	5.0	5.0	5.0
Maintenance	14.0	7.0	7.0	7.0
Cost of Capital—Vehicle	3.5	5.8	5.1	4.4
—Battery	—	1.6	1.6	1.4
Total Life-Cycle Cost	39.1	48.2	45.4	41.2
Premium Over Conventional Van	—	+23%	+16%	+5%

that will include manuals, training, service assistance, parts supply and distribution, and warranties. TVA and Detroit Edison will initially augment this infrastructure system by providing guidance to participating utility fleets on electric van operation and maintenance.

The GM electric van was selected for this project because of its unique features including its proven performance and reliability, and its backing by a major automotive manufacturer. Manufactured in England, this van has a 106-inch wheelbase and a 2,200-pound payload capacity, and is traffic-compatible. Over $25 million has been spent on the development of the van and its electronic drive train, and it has accumulated over two million miles of road service. The GM Electric Van is being introduced into this country as the GM Griffon.

The Phase 1, Van Acceptance Testing, completed by TVA earlier this year, indicated that the Griffon performed extremely well throughout the 7,400-mile test. The results of these performance tests conducted through a joint EPRI/TVA EV Test and Evaluation Project at the TVA Electric Vehicle Test Facility are summarized in Table 1.

The current cost for this van, including shipping and duty, is approximately $20,000 at current exchange rates. By 1987, it is projected that the cost for this vehicle will be reduced to less than $16,000, a level that makes electric vans nearly cost-competitive with conventional fleet vans on a life-cycle cost basis. Table 2 provides a simplified life-cycle cost comparison for conventional and electric vans.

Planned technology developments, production increases, and reductions in shipping and duty through the transfer of some or all of the vehicle production to the U.S. will enable further and significant price reductions. Such price reductions will make it possible to market electric vans as a viable alternative to conventional vans for fleet applications.

The GM Electric Van Market Application Development Project is a bold and promising new step toward achieving the commercialization of market-responsive electric vehicles. As electric vehicles represent an attractive opportunity for load growth and load management for electric utilities, the industry and its customers alike stand to benefit from the successful commercialization of this emerging technology. EP

Contributed by the Electric Vehicle Development Corporation.

Megawatts vs. megabucks.

When users need more electricity, it usually means utilities have to sink a lot more money into their systems.

General Electric has a better alternative. Modernization.

One of the quickest ways to take a load off your balance sheet is to add today's technology to yesterday's steam turbine-generators. In less than two years' time, we can upgrade almost any machine to better-than-new.

One example: There are more than 200 GE units now running that can be retrofitted with our brand new 26″ low pressure, last stage design.

If your oil-fired steam turbine is a 300 MW unit, typical of that group, you'll save 28,500 barrels of oil every year through improved efficiency: That amounts to roughly $750,000.

Put another way, you can use the same amount of fuel for boiler steam, and get 3000 more kilowatts.

Here's another way to modernize: Putting a GE automatic turbine control on one of your generating units could cut an hour off each start-up cycle. One year's fuel savings can pay for the changeover.

And another: A new thermal performance monitor will track how efficiently your turbine is operating. Your operators will know how to optimize performance and when to schedule maintenance to improve operation.

Call the GE Business Information Center at (518) 438-6500 and ask us to prove how much you can save with these retrofit options.

There's no easier way to get modern megawatts.

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REGULATORY REVIEW

THE AVOIDED COST CONTROVERSY

The Public Utility Regulatory Policies Act (PURPA), one of the five statutes comprising the National Energy Act of 1978, contains several provisions designed to encourage the development of cogeneration and small power production. The intent of Congress in enacting these provisions was to improve the overall efficiency of electric power supply, displace the use of oil and natural gas, decentralize power production, and lessen some of the adverse environmental impacts caused by conventional central station electric power generation.

Section 210 of PURPA, which contains the bulk of that statute's provisions relating to cogeneration and small power production, requires the Federal Energy Regulatory Commission (FERC) to promulgate rules implementing Congress's program. Among other things, the law requires FERC to designate, by rule, the methodology for calculating rates to be paid by utilities for purchase of electricity from "Qualifying Facilities" (QFs), i.e., those cogenerators and small power producers which meet the eligibility criteria set forth in PURPA. PURPA provides a guaranteed market for a QF's electricity, requiring utilities to purchase it.

Congress required, in Section 210 of PURPA, that such rates must be just and reasonable to the utilities' customers and in the public interest, and that the rates may not discriminate against QFs. In addition, Congress placed a ceiling on the level of the rates, i.e., they may not exceed the incremental cost to the electric utility of alternative electric energy. FERC, in its rule implementing these provisions, chose to require that rates for purchases from QFs be based on "avoided cost." FERC defined avoided cost as the incremental cost to the utility of energy or capacity or both, which the utility would otherwise generate itself or purchase elsewhere.

This issue has proven to be one of the most hotly disputed ones under PURPA. The level of rates chosen has two important effects. First, it determines the impact of purchases from QFs on the utility's cost of power production and ultimately the electric bills of the utility's customers. Second, it influences how much cogeneration and small power production will actually be developed. Avoided cost (PURPA does not use the term) approximates the incremental cost ceiling imposed by Congress. FERC thus chose the option which gave the greatest possible encouragement to QF development, while effectively forestalling the possibility that any of the savings from development of cogeneration and small power production will be passed on to the customer.

Translating the avoided cost principle into practice has been a major area of controversy. Methodologies for computing and forecasting avoided costs vary widely. The differences are apparent not only in computational details but also in conceptual approaches to "incremental costs" as the basis for setting "avoided cost" rates. The major conceptual differences include:

- Whether short- or long-run marginal cost should be relied upon;
- The period over which costs should be measured;
- The method to be utilized for computing marginal cost; and
- The treatment of firm and non-firm capacity.

The alternative methods which are being employed to compute avoided cost cover:

- Long-run marginal cost methods using specific unit approaches or expansion planning approaches;
- Short-run marginal cost methods using as a basis for estimating avoided cost, or reference unit, incremental heat rate, or production costing models;
- Purchased power considerations;
- Differential revenue requirements approach; or
- Average incremental cost methods.

As a result of the differing approaches used to calculate avoided cost, it has been argued that some states are adopting rates for purchases from QFs which may exceed the utility's avoided costs. If payments to QFs are higher than the utility's own costs would have been to supply an equivalent amount of power, the customers' bills are higher than necessary. If the rates to be paid QFs are lower than the total avoided cost, the customers' bills are lower than they would have been if the purchase had not been made. Thus, payments to QFs in excess of the utility's true avoided cost could overstimulate cogeneration development and result in ratepayer subsidies. Payments below full avoided cost give less encouragement to cogeneration development

A real shocker.

The bugaboo of every utility is stability problems.

It's usually caused by wild swings in voltage on transmission lines. But General Electric has a solution that makes them easy to control. And it's a lot less expensive than conventional ways.

The usual out has been to build new transmission lines or new power plants. One utility calculated the cost of building new lines to handle the problem at $75 million.

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Sometimes there's more GE-whiz in something that's been around a long time than in things that are brand new.

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but pass on savings from cogeneration to the consumer.

PURPA clearly requires that the interests of ratepayers and QF developers be balanced. FERC's rules are clear that avoided cost purchase rates should not exceed the true costs actually avoided by the utility. This means that there should be indifference between the utility's sources of supply and purchases from QFs. Some state legislatures and/or commissions have sought, on their own authority, to require utilities to purchase power from QFs at prices above avoided cost. The question arose whether they were preempted by federal law from so doing.

So far, there are two decisions by state supreme courts on this question. The two cases are irreconcilable, from the point of view of their reasoning on the question of federal preemption. Kansas has held that the state is preempted by PURPA from setting rates in excess of avoided cost; New York has held the opposite. In March 1985, the U.S. Supreme Court dismissed an appeal of the New York decision. Such a dismissal is a decision on the merits of the actions. Two justices dissented, objecting to the summary disposition of a question which will, they recognized, recur; there is litigation in several other states on the matter. It is likely that the question will again come before the Supreme Court in the next few years.

Contributed by the Finance and Regulation Department of Edison Electric Institute

STATISTICAL REVIEW

Table 1
Quarterly Electric Output (TWh)

Quarter	1984	1983	Percent Increase
First	612.3	559.8	9.4
Second	592.2	547.8	8.1
Third	654.0	652.0	0.3
Fourth	593.3	588.0	0.9
Year	2,451.7	2,347.6	4.4

Source: Edison Electric Institute Weekly Electric Output

1984 Electric Output

A strong demand for electricity during the first half of 1984 increased the annual electric output to a new high of 2,451.7 Terawatthours (TWh) (see Table 1). (Note: one Terawatthour equals one billion kilowatthours.) The 1984 output surpassed the 1983 output (2,347.6 TWh) by 4.4 percent. This growth was triggered by a combination of a strong rebound in the industrial sector and harsh weather conditions in the first quarter.

1984 in Review

A vigorous recovery in industrial production and very cold weather gave a big boost to electric output during the first quarter of 1984 (9.4 percent) when compared to the same period a year earlier (see Table 1). The highest industrial gain was experienced in the Central industrial region, regaining losses suffered in the 1981-82 recession. In addition, the Mountain region rebounded in 1984 after enduring the worst economic downturn in almost 20 years.

The second quarter continued with a strong demand for electricity from the industrial sector before leveling off. The effects of weather on electric output began early in May. On some days temperatures during this period reached levels as high as those of June 1983. June 1984 weather increased the demand for electricity from the residential and the industrial sectors to effect an 8.1 percent change over the same period in 1983.

The heat of the summer produced the highest electricity output for the week ending August 11, 1984, showing a record 54.1 TWh. The previous summer record occurred during the week ending July 23, 1983, with an output of 53.6 TWh. Even though the electric output for the third quarter produced a record figure, the increase was only 0.3 percent over the same quarter a year earlier.

Weather patterns during the last quarter of 1984 remained constant. As a result, the effect of residential and industrial demand for electricity during the first two months of the fourth quarter increased moderately at 4 and 5 percent, respectively, when compared to 1983. The effects of a mild December, with the exception of the cold wave that swept over the Rocky Mountain, Pacific Northwest, and Pacific Southwest regions, decreased the electric output to −4.7 percent as compared to December 1983. Electric output for the last three months of the year increased 0.9 percent over the same period in 1983.

Contributed by the Statistics Department of Edison Electric Institute.

Rethinking an axiom.

Conventional wisdom in the utilities business says that power transformers are so big and so expensive that you don't replace them unless something drastic happens.

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One axiom still holds true: The surest way to make money is to invest some.

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BOOK REVIEW

FOREVERMORE: NUCLEAR WASTE IN AMERICA

Donald L. Barlett and James B. Steele
W. W. Norton and Company, 1985
New York, 352 pp.

By James B. Hall

Diamonds may be forever (at least according to popular folklore) but radiation from nuclear waste generated on this earth is certainly not. The catchy title of the book itself belies a fundamental truth about radioactivity which the authors never bother to accurately explain. Radioactive materials do degrade, that is to say, the level of radioactivity decreases until a stable situation exists. This is not the case with many far more readily available toxic chemical substances.

A principal reason for the difficulty of dealing with nuclear wastes in this country is the misperception by the public, and accompanying fears, generated by greatly exaggerated accounts of the risks involved—such as those described in this book. Donald L. Barlett and James B. Steele are investigative reporters for the *Philadelphia Inquirer*. Their book is an expanded version of a series of newspaper articles. The chapter titles are illustrative of their focus:

Atomic Technology: Fantasy versus Reality
The Politics of Neglect
The Failure of Reprocessing
The Bid to Revive Reprocessing
The Buildup of High-Level Waste
The Search for a Repository
Losing Track of Waste
Burial-Ground States Revolt
A Dump in Every State
The Supersalesman of Nuclear Waste
America's Favorite Dump Site
Radiation, Waste, and the National Health

To objectively evaluate the issues raised by the authors would require a separate text of at least equal length to assess their one-sided, exaggerated sensationalism. Historians they are not. What is absent from this book is a balanced perspective on a challenging subject. Three themes continue to recur throughout their writing: (1) radioactive waste is the most hazardous substance on earth; (2) scientists and engineers do not know how to store or dispose of radioactive waste; and (3) politicians have failed miserably in dealing with the problem.

The hazards of radioactive waste are very important to understand so that an objective assessment of risk or relative risk can be made. Nowhere do the authors discuss what radioactivity is, where it comes from, the different kinds of radiation, and the known biological effects of radiation. Nor do they discuss the natural radiation from the ground and from cosmic rays which bombard the earth constantly. They do not mention the natural radiation from the minerals in stones or bricks in houses, the radioactive potassium in our bodies or the increased exposure to cosmic rays at higher elevations (such as is received by those who ride in high-flying jet aircraft). Instead, they alarm the reader with such statements as: "By the year 2000, it is projected, waste stockpiles will top 42 billion curies—enough to kill everyone on the face of the earth." Interesting, but irrelevant. A similar remark could be made regarding a whole host of toxic substances if one presumes such material would be meted out to every individual and that every individual would be crazy enough to swallow, hold or otherwise expose himself or herself to the danger.

Do scientists and engineers know how to store and dispose of radioactive waste? The authors infer that the termination of experiments to launch an atomic spaceship, the early problems with disposing of low-level wastes in wet regions using conventional shallow land burial technology, carelessness in transportation of wastes, and the non-viability of reprocessing are all proof positive that scientists and engineers don't know what they are doing. Hence, Barlett and Steele conclude, current plans for spent fuel/high-level waste geologic repositories and continual support (with Nuclear Regulatory Commission blessing) of shallow land burial technology for low-level waste disposal are not credible. The conclusions implied are not supported by the evidence presented. The examples referred to are really independent separate issues. It would have been helpful if the authors had tried to separate fact from fiction and differentiate between what is well known and what is less well known.

Unfortunately, the technical community has tended to oversimplify the challenge with such statements as, "We don't have any technical problems regarding waste disposal—just political ones." There are some technical problems which still need to be resolved for spent fuel/high-level waste disposal. While the physics of radioactive decay are well understood, the engineering complexities of containment of high-level radioactive wastes in specific geohydrologic settings for extremely long time periods need to be carefully worked out. Current plans of the Department of Energy (DOE) call for extensive site-characterization activities extending over a period as long as five years for each of the recommended repository sites. These activities should provide the earth scientists with sufficient information to evaluate the ability of a particular host medium to contain high-level nuclear wastes. It should also reveal the information needed to optimize the design of a waste package to match the properties of waste materials and geohydrologic

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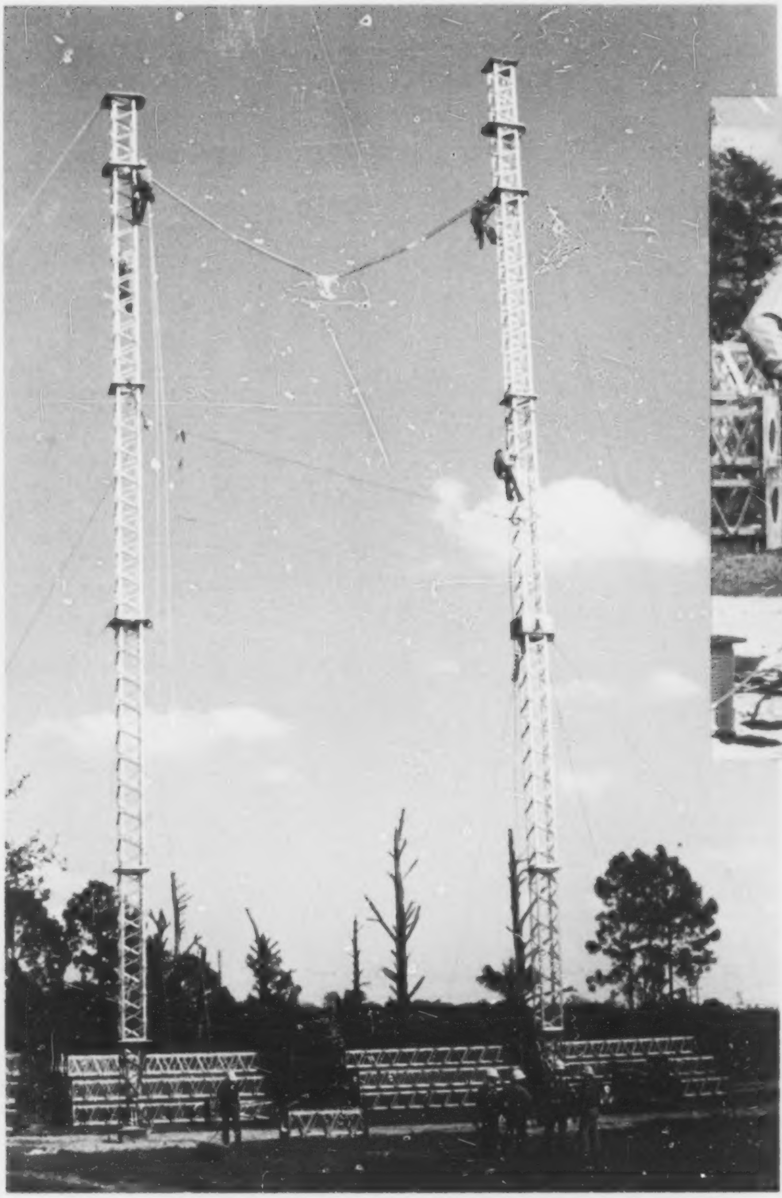

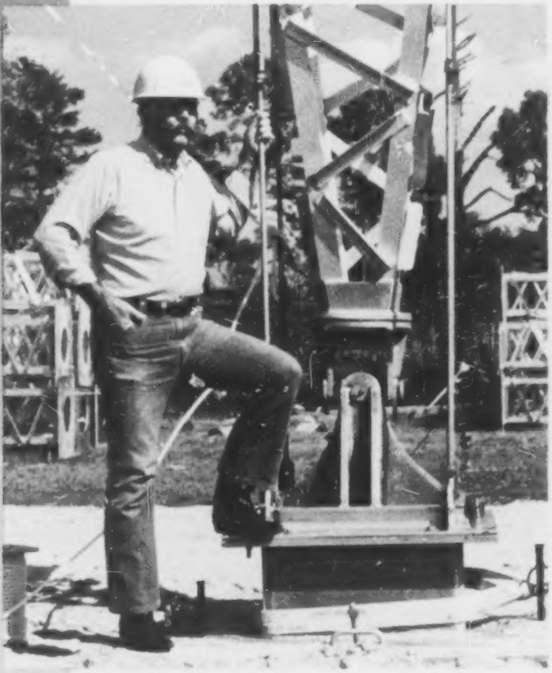

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settings. A more balanced presentation by the authors would have pointed out in detail the careful planning underway by DOE to ensure the adequacy of any site for a geologic repository.

Barlett and Steele paint a particularly grim picture of the ability of the federal government to meet the political challenges of dealing with nuclear waste. They do treat Congress, DOE, and the many regulatory agencies in equally poor fashion, that is, with great disdain for their actions during the last several decades.

There is a lengthy presentation of some of the problems associated with the regional compact formulation mandated by the Low-Level Radioactive Waste Policy Act of 1980. To be sure, the road has been rocky, and it may be questionable whether Congress will approve the six compacts introduced thus far, unless access for the regions or states without established sites can be assured for a reasonable time period. Yet the authors might have given more credit where credit is due. The difficult compact process is proceeding, and the "regional chaos" they describe is currently being debated in the form of some promising amendments to the Low-Level Waste Policy Act which have only recently been introduced in Congress. While these latest actions have occurred since the book was published, they do reflect the fact that things may well not be as hopeless as the authors suggest.

In a democracy such as ours, it is indeed difficult to forge a consensus of support for establishing nuclear waste disposal sites that few seem to want or recognize the need for—especially after fears and misperceptions have been fueled by articles and books such as this one.

However, lest those with technical backgrounds in nuclear fields are too quick to criticize, it is important to consider when a comprehensive treatise dealing with radioactive waste, suitable for reading by the public, was last written by members in their ranks. If nuclear physicists, government planners, utility industry spent fuel specialists, and nuclear industry technicians would leave the writing to investigative reporters, they must be prepared to accept the results, namely, the absence of accurate, balanced descriptions of what radiation and radioactive wastes are and, most importantly, the relative risks of dealing with radioactive materials. They should read this book. It is not nuclear waste, but rather the waste created by such exaggerations, misperceptions, and resultant fears that may well be with us forevermore. *EP*

James B. Hall is Director of the Utility Nuclear Waste Management Group, Edison Electric Institute.

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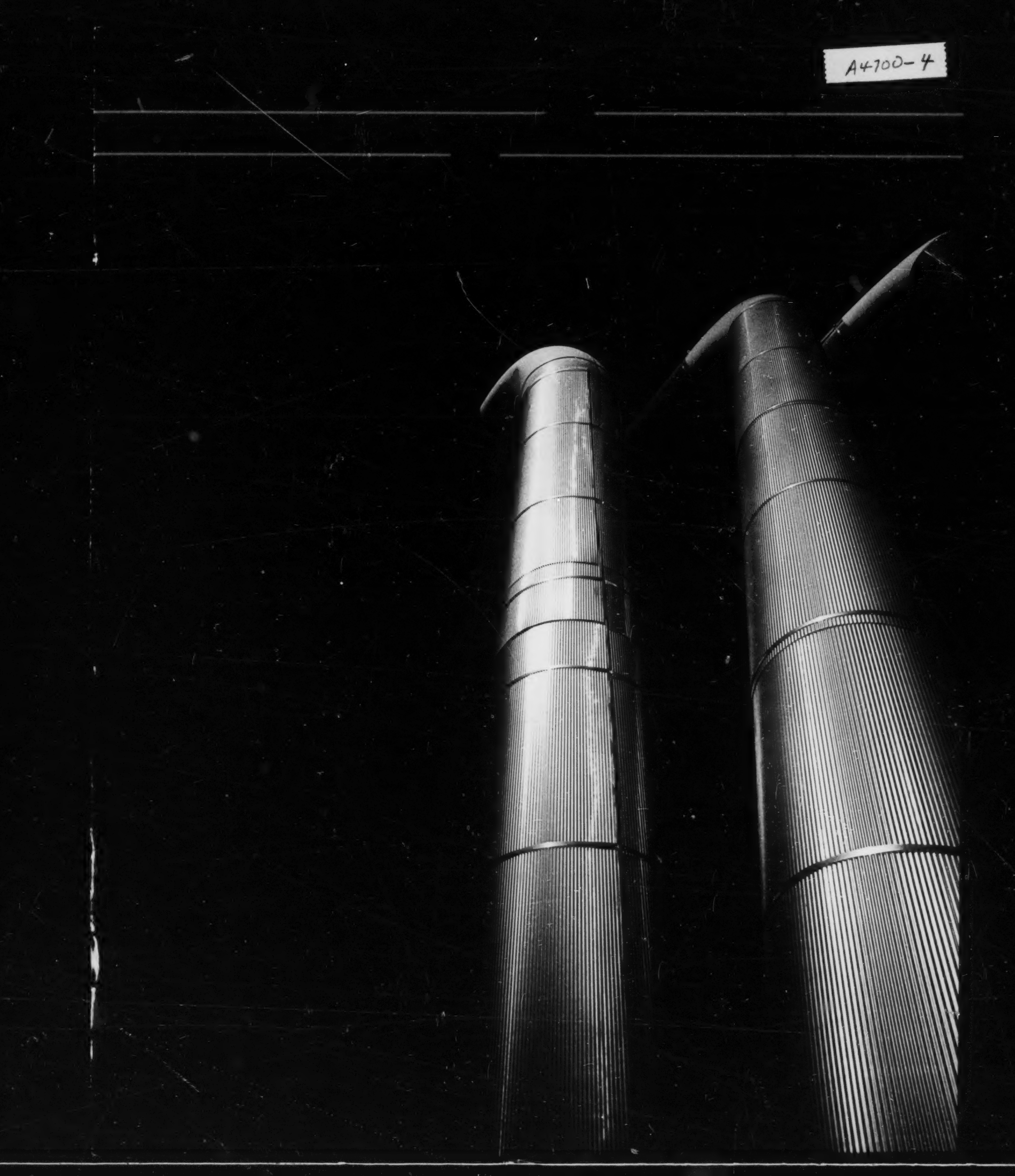

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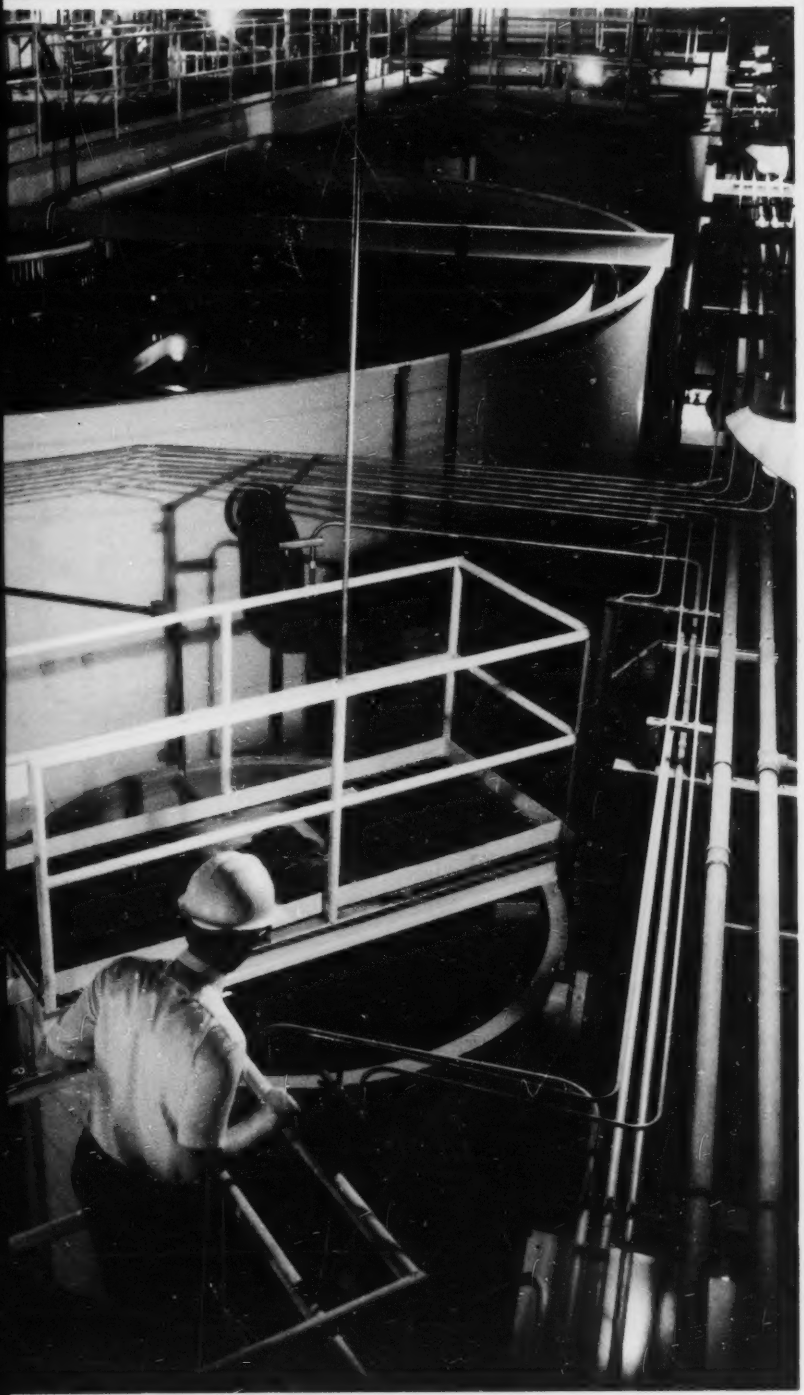

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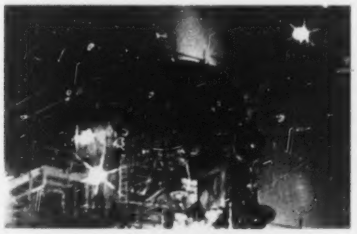

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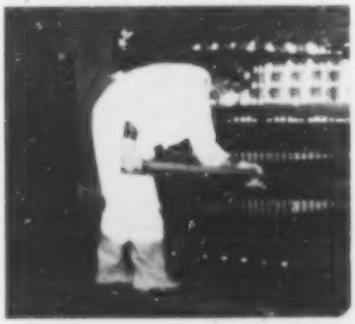

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A PERIODIC REPORT FROM BURNS AND ROE, INC. WINTER 1985

Ram Budwani: Burns and Roe's Boswell to America's electric utilities

In 1969, when Ramesh N. Budwani first arrived in New York from Bombay, he was 28 years old. He had an immigration visa, a bachelor's degree in chemical engineering, a postgraduate diploma in nuclear engineering, three years of nuclear experience and $500 in his pocket. But he didn't have a job, and he didn't know a soul in the United States.

Today, 16 years later, "Ram" Budwani is manager of cost analysis for Burns and Roe. And he has something no other American has: the most complete and credible data base on power plants in existence, and an international reputation as one of the foremost authorities on how much it costs to design, build and operate power plants.

Between 1969 and 1976, Budwani worked for three U.S. engineer/constructor (E/C) firms. It was then he became aware that the data available on every facet of power plant design, construction, start-up and operation was very limited – and even the available data was, in terms of credibility, a mixed bag. While each E/C firm had its own data, there was little reliable industry-wide data on which to draw.

On his own, and primarily as a hobby, Budwani wrote to a number of utilities asking if they would provide such data, with an assurance that no specific utility or plant would be identified. A handful of utilities responded, and with the data they provided – combined with data he had already collected – Budwani wrote an article which was published in 1974 in *Power Engineering* magazine. It was obviously badly needed, because it became instantly popular throughout the power industry.

Budwani collected and compiled that first set of data in only a few hundred hours of his spare time. Using feedback from the first article in *Power Engineering*, and with more cooperation from utilities and individuals, Budwani wrote a second article which *Power Engineering* published in 1975.

Budwani joined Burns and Roe in 1976. His subsequent articles, based on a constantly expanding data base, appeared in 1978, 1980 and 1982. Early in 1985, Budwani's sixth article was published in *Power Engineering*; it spanned 28 pages and ran as a special section, featured on the cover. The feedback received by Budwani indicates that practically every utility with a nuclear plant uses Budwani's data base to evaluate the performance of its nuclear plant.

Budwani estimates that he has spent about 14,000 man-hours of his personal time on the six studies and numerous related articles and presentations. Today every major U.S. utility is represented in his data base.

When Budwani first started building his data base, he couldn't have conceived of one of its major uses today: prudency investigations. In the past year, seven electric utilities – all among the largest in the U.S. and ranging from coast to coast – have called on Budwani and Burns and Roe for comparative analyses in support of possible prudency investigations by public utility commissions.

Ramesh N. Budwani

About a year ago, Budwani provided expert testimony in court, based on his data base, on behalf of Long Island Lighting Company's Shoreham Nuclear Power Station. He has recently completed rebuttal testimony and is scheduled to testify soon on behalf of another utility client. Budwani's prudency assistance included both pressurized water reactors and boiling water reactors (Mark II and Mark III containments).

"It is virtually certain," says Budwani, "that a utility seeking to recover the cost of a nuclear plant through rate adjustment will be exposed to the rigors of an exhaustive investigation designed to determine the prudence of utility management from project inception to commercial operation." In addition to Budwani, Burns and Roe has assembled an excellent team of prudency experts, and is now one of the leading E/C firms involved in supporting utilities in possible prudency investigations.

To avoid even the appearance of conflict of interest, Budwani keeps his work on his data base separate from his Burns and Roe work; his data base, consisting of some 15,000 pages in almost 200 loose-leaf binders, is kept at home and no one else has access to it.

Budwani is already at work on the next phase: an expanded update of his articles in the form of a "Reference Data Base for Power Plants" that will cover more than 50 magazine pages and contain more than 100 exhibits. Barring any problems, it should be published sometime in 1985.

Although Budwani considers his data base "my contribution to the power plant industry," he intends to make the upcoming version his last. Would Budwani consider permitting someone else to carry on his work? "That's out of the question," he insists. "There is too much confidential data there, and I wouldn't release it to anyone."

Current and recent Burns and Roe projects

Following is a partial list of current and recent Burns and Roe projects involving nuclear and fossil plants, power technology projects, and overseas projects.

Nuclear plant projects

Electric Power Research Institute: small light water reactor conceptual design, including use of modularization techniques; high-temperature gas-cooled reactor seismic isolation study; evaluations and testing of high-temperature concrete and seismic isolation for liquid metal plants, as part of an international exchange program; continuing services for the design of a large-scale prototype breeder plant.

Princeton University: commissioning of the tritium and related HVAC systems on the Tokamak fusion test reactor, including detailed design and construction.

Nuclear plant services

GPU Nuclear Corporation: for Three Mile Island Unit 1, a plant computer system multiplexer upgrade. **Nebraska Public Power District:** completion of a plant computer system upgrade at Cooper Nuclear Station; continuing work on enhancements to the plant computer system. **Pacific Gas & Electric:** implementation of a spare parts management program for the Diablo Canyon Nuclear Plant.

Fossil plant projects

Central Hudson Gas & Electric: construction started on reconversion of Danskammer Units 3 and 4 from oil-fired to coal.

Fossil plant services

Jersey Central Power & Light: special engineering services. **Northern States Power Co.:** technical assistance. **Florida Power & Light:** blowdown recovery basin study at Port Everglades. **Gainesville (Florida) Regional Utilities:** operational assistance program for Deerhaven Power Plant, Unit 2.

Power technology projects

West Virginia Public Energy Authority: power requirement study. **Combustion Engineering:** assessment of a circulating fluidized bed combustion conversion for Consolidated Edison's Astoria Unit 10. **Allied Resources Corp.:** assessment of the district heating and cooling system for Springfield, MA.

Overseas projects

Korea: consulting services, including bid evaluation, to Korea Electric Power Corp. on Korea Nuclear Units 11 and 12 (900MW each). **Taiwan:** continuing engineering, design and construction supervision for conversion and retrofit of 150MW oil-fired unit to coal. Development of a software program for data bank system of fast breeder reactor technology for Taiwan Power Co. **Japan:** continuing project assignments for Mitsubishi on Japanese demonstration fast breeder reactor project.

John McCaughey

Cogeneration: Sweet Dream or Nightmare?

When regulated electric utilities must buy excess power from unregulated cogenerators, what happens to costs, reliability, and future capacity?

In the old days, utility executives had what one investment banker calls the "edifice complex:" a love for building bigger and better power plants to generate electricity. A harsh dose of aversion therapy doled out by regulators during the last decade has cured all but the most fearless utility officials of that tendency. Indeed, some chief executives have staked their professional reputations on a vow never again to build another central generating plant.

Oddly enough, while the utility professionals shrink from construction, a motley group of entrepreneurs, financiers, alternative energy fans, and industrialists are enthusiastically erecting generating equipment all over the country. These are the cogenerators—the new heirs to the edifice complex. For the utility industry, the cogenerators proffer welcome opportunities and pose persistent problems.

Cogeneration sounds dauntingly technical, but it's very simple: the production of heat or steam for industrial or commercial purposes, coupled with the simultaneous generation of electricity. The proportions can be adjusted to fit the needs of the cogenerator: a lot of process heat, for example, and a little electricity, or vice versa. In energy-intensive industries such as pulp and paper manufacture, food processing, chemicals or enhanced oil recovery, cogeneration has been commonplace for decades. But today its popularity stems from the Public Utility Regulatory Policies Act of 1978 (PURPA), part of the energy plan fashioned under the Carter Administration. At the time, when the common wisdom held that America was fast depleting its oil and gas, cogeneration caught the politicians' fancy because of its efficiency, roughly twice that of a conventional utility power plant.

Today, seven years after PURPA, it's clear the politicians were wildly successful. Cogeneration has become a multi-billion-dollar industry. Parts of the country, where power shortages once seemed inevitable, are now awash in electricity supply, an estimated 25 percent of it in California coming from cogenerators. In a sense, the political initiative has run amok. In some parts of the United States, production of cogenerated power has only a remote connection with the logic of the marketplace. The electricity is being generated simply because regulated prices make it profitable to do so. Such cogeneration plants are known as "PURPA machines."

Fuzzy on Details

Like most laws, PURPA was good on the big picture but rather fuzzy on the details. As the entities most affected by the new law (because they are obliged to accept and pay for power from cogenerators), electric utilities often find themselves on the sharp end of PURPA: wrestling in the courts or with the regulators over the myriad ambiguities embedded unwittingly in the act by its creators.

On one major point, however, the legislators were not even slightly vague. With Congress worried about anti-competitive effects and keen to encourage the injection of as much non-utility capital as possible into cogeneration, the Federal Energy Regulatory Commission (FERC) decreed that electric utilities can own no more than 50 percent of a cogeneration project and receive PURPA benefits.

To the utility industry, this has always seemed an odd and irksome prohibition, contrary to the public interest and inconsistent with Congressional intent. "Why exclude from cogeneration the entity that has the expertise and the experience and has the relationship with the customer and has been in the power generation business?" complains David Owens, the Edison Electric Institute's director of rate regulation. "Why exclude the electric utilities? If the intent is to develop the maximum amount of dispersed energy sources and to accelerate the development of new technologies, then it's illogical to exclude the utilities." Earlier this year, Kidder Peabody, the Wall Street investment house, tried to persuade FERC to let utilities own more than 50 percent of a cogeneration project—using an ingenious partnership arrangement that they argued separated ownership of a

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John McCaughey is senior editor of The Energy Daily.

Oil refineries and other heavy industrial processing plants have been peaceful cogenerators for years, but PURPA has brought disturbing competition to the power marketplace.

Applied Energy Services

Applied Energy Services (AES) has purchased four boilers, scrubbers, and a turbine from ARCO's Beaver Valley chemical plant near Pittsburgh, Pennsylvania. AES will invest $116 million in refurbishing the coal-fired facility; it will produce and sell 120 megawatts of electricity to West Penn Power and 125,000 pounds of steam per hour to ARCO.

cogeneration facility from management control. FERC did not buy the argument.

Cogenerators face perils at the Federal Energy Regulatory Commission, too. Most cogeneration plants are not financed by the industrial host, but by a third-party group of investors. In a case involving a pharmaceuticals plant in Puerto Rico, FERC ruled in August that PURPA's guarantee of back-up power does not extend beyond the cogeneration plant's owner (in this case, a third party). In other words, the industrial host was not entitled to one of PURPA's most important assurances. If upheld, the decision would wipe out 75 percent of the cogeneration market, says Michael Zimmer, a Washington, D.C., attorney who runs the Cogeneration Coalition, an industry trade group.

Gathering Steam

Unleashed to dive into cogeneration themselves, the utilities would find a rich new field. Cogeneration by U.S. manufacturing industries will reach 26,000 megawatts of electrical capacity by 1995, says a study by Washington consultants Hagler, Bailly and Company last year. A FERC analyst predicts 30,000 megawatts of cogeneration capacity in the U.S. by the year 2000. Frost & Sullivan, the New York market research firm, reckons the market for very small (50-to 800-kilowatt) cogeneration plants will approach $15 billion by the end of the century. And the Gas Research Institute, the natural gas industry's R&D arm, estimates 16,000 megawatts of industrial cogeneration by 1995, plus about the same amount in the commercial sector. Between 1980 and mid-1985, more than 23,000 megawatts of cogeneration projects requested FERC certification.

Thanks to PURPA, a tripartite cogeneration industry is emerging. There are small cogenerators—hospitals, universities, and other institutional users—whose main interest is in cutting their electricity costs by producing their own power. For them, PURPA's principal appeal is its guarantee of back-up service from the electric utility grid. The traditional industrial cogenerators, like refineries or paper manufacturers, are flourishing, mostly preoccupied with their own needs for process heat and electricity. And finally, there are the "PURPA machines"—deliberately oversized in terms of the steam needs of the host factory, built mostly because of PURPA's generous inducements. These plants exist expressly to profit from the sale of electricity. It's unlikely that PURPA's creators envisioned this result.

Cogeneration's development is far from uniform: different regions and states show vastly different results. In California, state regulators were aggressively promotional from the start, and the state's utilities are now swamped by more cogeneration than they need. Similar market saturation threatens in Texas. The heavy industries that garland the Gulf Coast all have enormous steam requirements. This has led to large cogeneration plants, and these have led to surplus in some service areas. But in the Pacific Northwest and Midwest, cogeneration has had almost no impact—largely because utility rates are too low to inspire cogenerators.

The largest untapped potential today probably exists in the Northeast. In areas like New England, utilities have abandoned their early skepticism about cogeneration and now welcome these unregulated power producers as their salvation. Utilities there have watched the cost of new nuclear stations (Shoreham, Millstone 3, and Seabrook 1) balloon and are as reluctant to build new capacity as their regulators are to permit it. Central Maine Power Company and Northeast Utilities are actively soliciting cogenerators. Northeast reckons it will need new capacity by 1993 without power from this source. With that power, "We can clearly put off that need until the late 1990s," says Brian Curry, who runs the company's small power program.

Before the Bench

No law as complex, important, and imprecise as PURPA could long avoid challenge in the courts, and PURPA has been up before the bench many times. At the federal level, there have been three challenges. One dealt with the constitutionality of PURPA itself: a judge in Mississippi ruled that PURPA was unconstitutional, but he was overruled by the U.S. Supreme Court. Two others involved avoided costs, the complex formula which sets the price a utility must pay for cogenerated power. Another case, involving Kansas City Power and Light, is before that state's supreme court and may reach the U.S. Supreme Court.

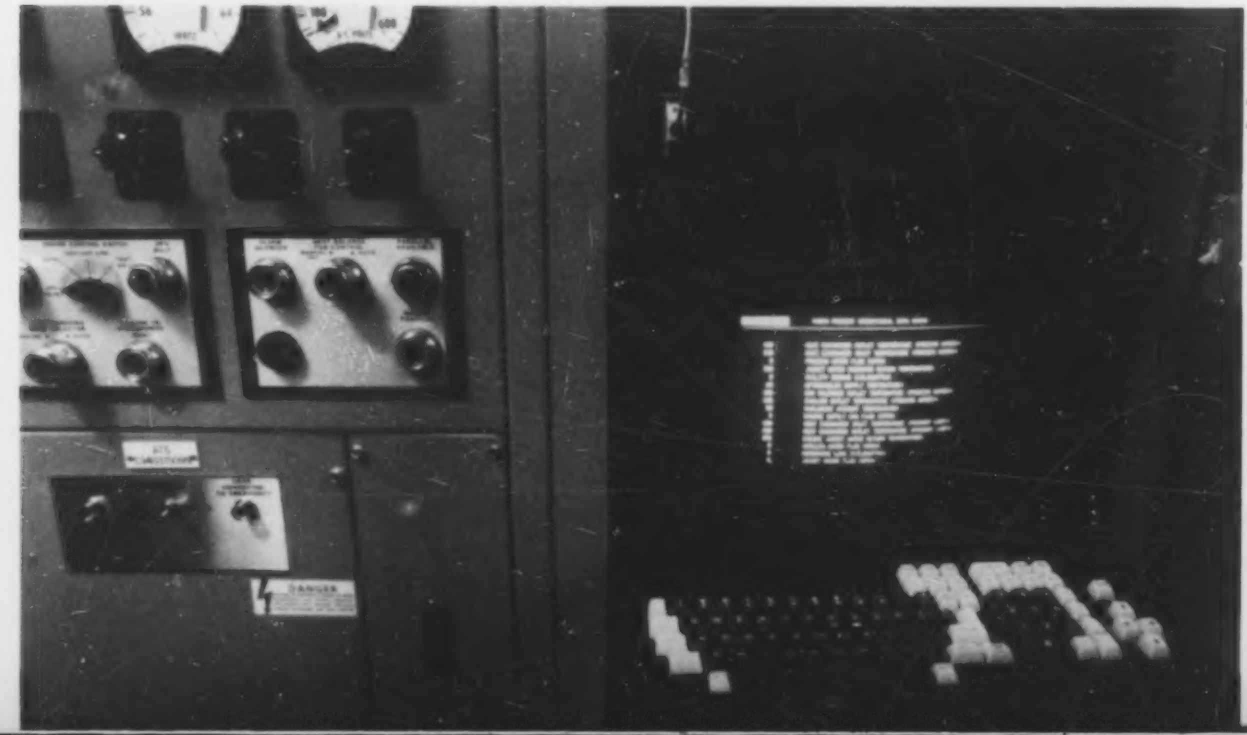
Thus, PURPA presents a nightmarish host of pressing and unresolved problems.

Avoided Cost

In PURPA, Congress said that utilities must buy electricity from cogenerators and small power producers at the "incremental cost of energy," which regulators have interpreted as the cost a utility avoids by not having to build new capacity or buy power from elsewhere. But what happens when a state sets rates that a utility believes are higher than its true avoided cost? Why, in such a case, should a utility ratepayer subsidize the development of the cogenerator's technology, while being precluded from any of cogeneration's benefits?

In New York, this issue prompted Consolidated Edison to go to the U.S. Supreme Court. Although the court refused to take the case, Judge Harry Blackmun filed an interesting dissent. Blackmun said that he considered the question of whether a state can require utilities to pay more than the full avoided cost rate for their mandatory purchases a "substantial" legal question that the high court should debate. Blackmun pointed to Consolidated Edison's evidence that 10 other states besides New

Hotel, restaurant, and supermarket chains and other members of the commercial sector are eyeing cogeneration as a way to cut electricity costs.



Gas Research Institute

York have authorized or required payments to cogenerators in excess of avoided cost.

Comments EEI's David Owens: "If a state commission permits a rate greater than full avoided cost, we believe it has disrupted the level playing field. Our definition of avoided cost is that the customer should be indifferent to whether he is being supplied by the electric utility or by someone else. The customer's rate should be no higher if the utility provides the service or if it purchases the power from some other source. The customer should be clearly indifferent. PURPA should not be a subsidy. If it is a subsidy, let it be clearly seen as a subsidy, and let the regulators recognize the ramifications of that."

How should cogenerators be paid? Cogenerators argue (and some utility officials agree) that their projects would never get off the ground without some assurance of a revenue stream for the power that is produced. Skeptical financiers, cogenerators argue, will not put up the money for a project unless the cogenerator can demonstrate a certain level of cash flow, especially when avoided costs are fluctuating. A high rate to cogenerators, supporters of the technology argue, may not reduce the ratepayer's electricity bill in the short-term, but it benefits him in the long-term by ensuring that a utility does not have to build a new generating plant.

While utilities and regulators

Devon Jackin / Folio, Inc

Dick Luria / Folio, Inc

Above, right:
The Medical Center Del Oro Hospital in Houston, Texas, recently installed a gas-fired cogeneration system. If hospitals turn to cogeneration en masse, the electric utility industry may lose substantial sales to natural gas companies.

Right:
Cogeneration in the industrial sector may double in electrical capacity in the next 10 years.

Finally, there are the "PURPA machines" . . . These plants exist expressly to profit from the sale of electricity. It's unlikely that PURPA's creators envisioned these results.

(notably in New England) have been sympathetic to these arguments, utility executives insist that—in fairness to ratepayers—payments to cogenerators should balance out over the life of a contract. Paying a cogenerator higher rates at the beginning of a project also raises a few ticklish problems. Once on line, the cogeneration plant might fail to provide the power or to meet performance standards. Or the utility might not be able to rely on the power being available at peak periods. That leaves the utility with the job of finding replacement power, the ratepayer with the annoyance of already having paid the cogenerator a substantial amount of money, and the regulators with the unpleasant task of deciding from whom the costs should be recovered and whether the utility should be deemed imprudent for making the arrangement in the first place.

Questions like these disturb the tranquillity of regulators and utility executives in California and Idaho, among other states. In California, regulators' anxiety to encourage cogeneration led to what has been termed a "gold rush"—with cogenerators dashing to provide power at the high avoided cost rates mandated by the regulators. California's regulators were forced to suspend the lucrative prices offered to cogenerators and small power producers. This will be one of the key issues in cogeneration: how will the regulators dig themselves out of the gold rush that has engulfed their state and the legal challenges that are likely to follow?

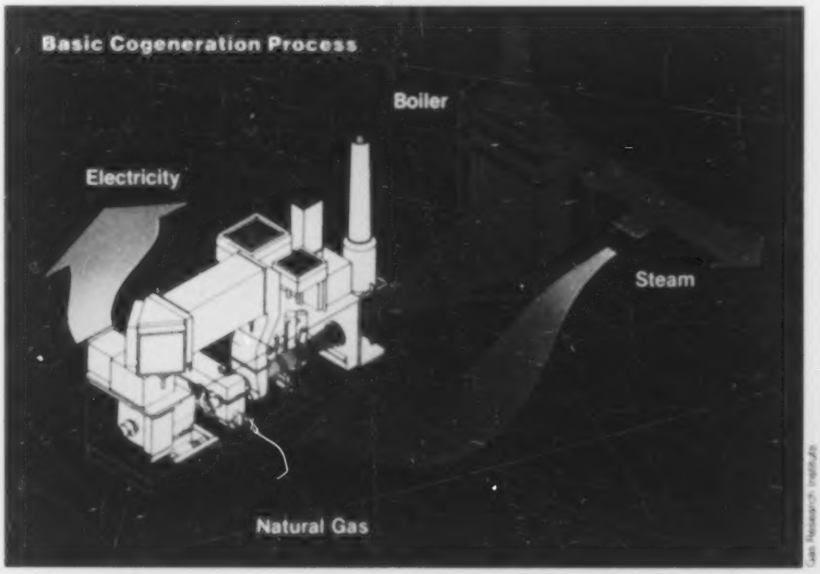
Wheeling

How much access should cogenerators have to utilities' transmission lines and how much should they pay for it? Under PURPA, cogenerators and small power producers can sell only to their local utility, but many would like to wheel their power to other utilities. Some utilities simply lack the transmission capacity. That seems to be the case in Pacific Gas and Electric's northern district. The California Public Utilities Commission is investigating whether mushrooming small electric power production may be overloading transmission systems in the state. From 1980 to 1984, the number of megawatts represented by signed contracts between PGandE and small power producers increased from 204 to 6,953. The utility has about 2,000 megawatts of cogenerators and small power producers waiting to be hooked up in its northern district. Similar problems exist in New England, where Boston Edison Company sees "a lot of cogeneration off our system. But we find cogenerators have some problems getting the power to us," says an executive there.

Some regulators would like to see more wheeling. "The optimum market for cogeneration of electric power in the United Sates will not be fully realized until a policy of open wheeling of all electric power is available," Philip O'Connor, chairman of the Illinois Commerce Commission, told a recent meeting of the International Cogeneration Society. This may not be as easy as it sounds. Transmission systems were generally designed "to link the generating plant to the load center and to ensure reliability," says EEI's David Owens. "The U.S. transmission system," he maintains, "was not designed as a common carrier."

System Reliability

The old-fashioned and axiomatic obligation to serve has taken a battering in recent years, and some heretics believe that utilities should



Gas Research Institute

no longer feel themselves bound by it. Still, for regulators and most utilities, the obligation remains the rule. Granted that reliable cogeneration can help utilities meet their load, but what happens when the cogenerator doesn't have the power when needed? The utility still assumes it has the obligation to serve. "Regulators may not call a cogenerator an electric utility," comments Owens, "but the cogenerator has the attributes of a utility. The standards that regulators have developed for the industry are very stringent ones, and, if they are going to hold us to those standards, some modifications may have to be made to protect the ratepayer."

Some utilities are grappling with this problem, structuring contracts with cogenerators to assure reliability and to "make them look more and more like our system," says an executive with Central Maine Power. This utility offers cogenerators rate incentives to deliver on peak, requires that cogenerators perform preventive maintenance at mutually agreeable times, and may in the future negotiate for automatic control of cogenerated power.

Rate Design

As utility planners are painfully aware, some factors, such as inflation and interest rates, cannot be forecast. In cogeneration contracts, who should bear the risk of such upsets? In Oklahoma, regulators insist on the right to alter avoided cost rates to take such imponderables into account. Cogenerators complain that such "second guessing" would make it impossible for them to finance projects. The dispute has raised doubts about cogeneration's future in the state. Applied Energy Services, a cogeneration developer based in Arlington, Virginia, was pursuing a 300-megawatt project in Oklahoma, but its future is uncertain. "The issue is: would the contract be financeable? We haven't tested the waters yet," said Roger Naill, the firm's vice president.

Pandora's Box

Simmering beneath all these visible vexations are more vague threats that are nonetheless real. Consider the possibility that cogenerators could do to the utility industry what MCI and other carriers did to mighty AT&T—skimming off the most profitable industrial operations, leaving the utilities with the less profitable residential and commercial customers, but with much the same fixed costs.

Or what of the more real possibility that cogeneration represents a way for the natural gas industry to purloin customers now served by the power companies. Most cogeneration plants—from very large to very small—are fueled with natural gas. Cogenerators are a ripe new market for gas companies anxious to unload surplus supply. In some areas, gas utilities offer cogenerators discounts from standard industrial rates; in others, interstate gas pipelines are taking equity positions in big cogeneration projects to help them along.

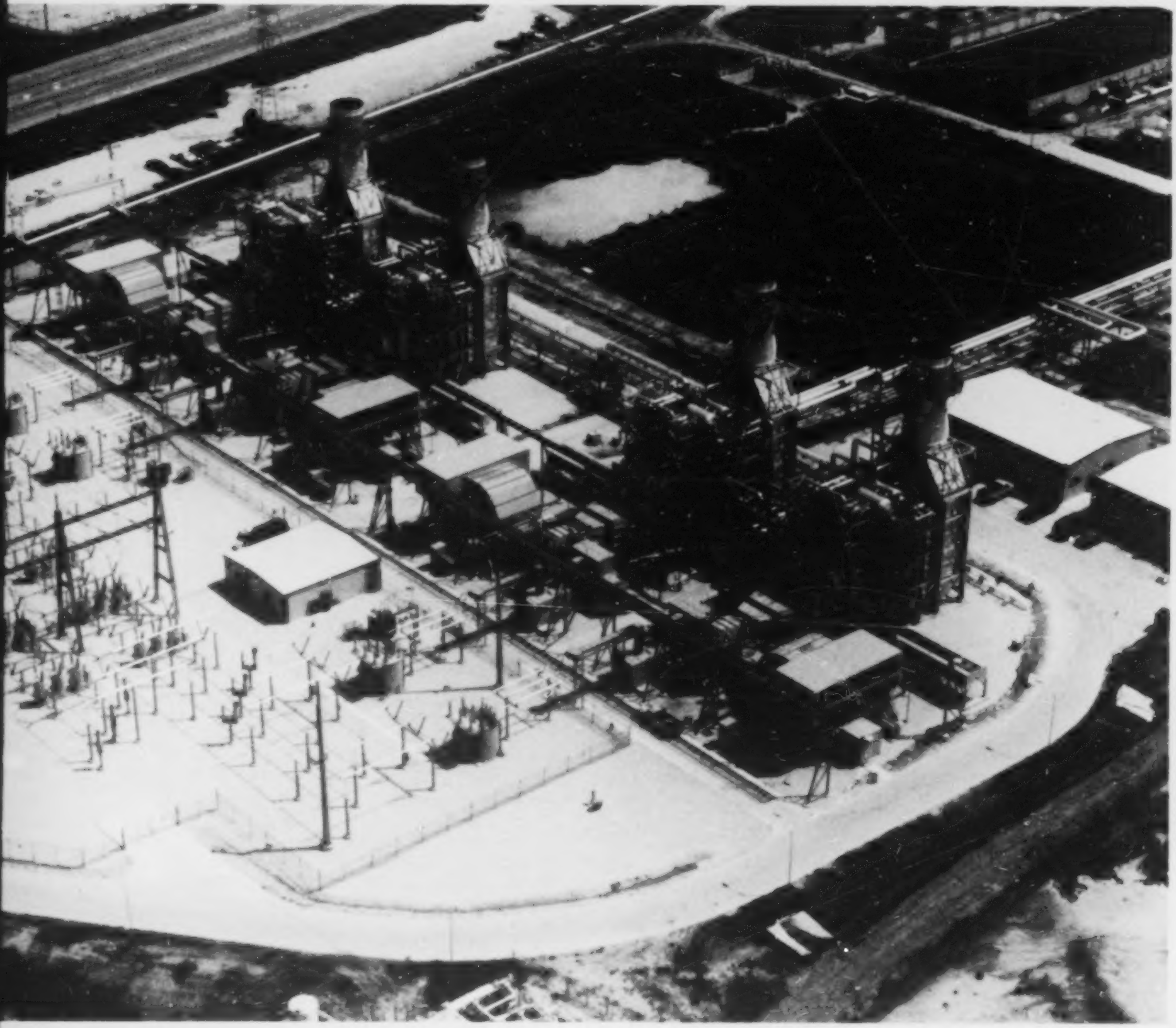
This competition from gas could cost the electric industry heavily in lost sales. Consider the Medical Center del Oro in Houston, which installed a gas-fired cogeneration system recently. The Gas Research Institute, which helped develop the system, reckons the hospital will cut its purchases from the electric utility from 545,000 kilowatt-hours a month to 136,000 kilowatt-hours. Gas used to supply only 30 percent of the hospital's energy needs; with the cogeneration system, that's up to 90 percent. And this is not an isolated case: the American Hospital Association reckons that over 4,000 of the 6,965 U.S. hospitals are candidates for similar cogeneration units.

General Electric Company

The $100 million Bayou cogeneration plant in Houston, Texas, generates 300 megawatts of electricity, while producing 1.4 million pounds of steam per hour. The electricity is sold to Houston Lighting & Power, while the steam is used by Big Three Industries and five other chemical plants nearby.

Coexistence?

The electric power industry may



draw some comfort from the fact that the cogeneration boom seems to be moderating. The situation in California and Texas, where the markets are deluged with far too many very large projects, may have "a chilling effect" on other regions of the country, says one expert. Utilities and regulators alike are bound to be more cautious henceforth about how aggressively they pursue cogeneration. Most agree that there will be fewer "PURPA machines," and that big industrial plants will be satisfied to produce only enough steam and power for their own needs. Some talk of a shake-out just ahead in the cogeneration business, with the more speculative developers falling by the wayside.

Cogeneration started as a way to enhance the efficiency with which we use oil and natural gas. When PURPA passed in 1978, these fossil fuels seemed to be on the way out. Today, a scant seven years later, the world is awash in oil and gas. But cogeneration remains a dynamic business, with growth aplenty still to come, and PURPA has become the engine driving increased competition in the electricity business.

It remains to be seen how well electric utilities and cogenerators will coexist. PURPA created a mixed system, part regulated, part unregulated. The effect of this mixed market on the cost of service, system reliability, and future generating capacity will decide the fate of the new heirs to the edifice complex. ▰

Steven P. Kraft

No-Fault Insurance For Nuclear Accidents

The Price-Anderson Act protects both the public and utilities in the use of nuclear energy. That's why Congress should not let the law expire.

Many people would be startled to discover that their property insurance does not protect them from earthquakes, volcanoes, floods, and accidents at nuclear power plants. While a property owner may try to buy additional insurance for these events, it is not available for nuclear power plant accidents.

It is not available only because the public is *already* financially protected from such accidents through legislatively mandated payments made by the owners of nuclear power plants—electric utility companies. Regardless of who may be responsible for such an accident—supplier, engineer, constructor or utility—the utility must, by law, assume full financial liability for off-site damages. This unique form of no-fault insurance has protected the public financially for the past 28 years, beginning with the passage of the Price-Anderson Act in 1957.

Briefly, the Price-Anderson Act was devised to cover accidents related to the commercial generation of electricity from nuclear energy. The act's coverage includes activities at nuclear power plants as well as the transportation of nuclear fuel to and from the plant, the transportation of nuclear waste from the plant, and the storage of nuclear fuel and wastes at the plant site. (The act also indemnifies federal contractors involved in nuclear activities and will cover the storage and disposal of nuclear waste by the federal government. Issues about these activities are not discussed here.)

Compensation for damages from a nuclear power plant accident comes from two sources: (1) insurance purchased by the electric utilities, and (2) payments collected from the utilities retrospectively if additional funds are needed. In return for shouldering the burden of full liability, utilities have been granted a limit on the financial extent of this liability. In the extremely rare event that damages exceed even this cap, Congress is required to assess the situation and act promptly to give the public protection. Moreover, utilities involved in such an event must waive their legal rights to normal defenses so that the process of compensating the public can be streamlined.

Since 1957, the Price-Anderson Act has been called everything from landmark, enlightened legislation, a law 30 years ahead of its time, to an imponderable subsidy to the "electronuclear" industry. With the act due to expire on August 1, 1987, controversy over its extension swirls in the halls of Congress, with an occasional outcropping in the press. Some interests want the act modified substantially; others want the act repealed altogether. Still others, like the Edison Electric Institute, believe that Price-Anderson offers the best way to balance the needs of protecting the public and of protecting electric utilities so that everyone can enjoy the benefits of nuclear energy; they believe that no changes should be made that will destroy the act's intention and effectiveness.

How Price-Anderson Began

On August 30, 1954, President Dwight Eisenhower signed into law the Atomic Energy Act, inaugurating the commercial nuclear era by permitting the private ownership of nuclear materials.* Congress had determined that, based on the experience of the Atomic Energy Commission (AEC), the use of nuclear energy to generate electricity was technologically and commercially feasible, and that greater participation by the private sector would not endanger public health and safety, provided that such private activities were subject to stringent government controls.

However, Congress' vision of private enterprise rapidly developing peaceful applications of the atom could not be realized unless some key problems were solved. Who would be liable—and to what extent—for potential injury and property damage in the remote chance of a nuclear power plant accident? Regardless of how low the

When this article was written, Steven P. Kraft was Director, Nuclear Activities, at Edison Electric Institute. He is now Director, Utility Nuclear Waste Management Group, Edison Electric Institute.

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*Under the Atomic Energy Act of 1946, the Atomic Energy Commission was authorized to enter into contracts with private firms, but the federal government retained ownership of facilities and materials.

Timothy Wright, Virginia Power

Nuclear power plants strive for safety and reliability. Employees working in radioactive areas wear protective clothing. The Price-Anderson Act protects the public living near the facility with no-fault insurance against nuclear accidents.

Institute of Nuclear Power Operations

Senior engineering technician at Philadelphia Electric Company's Peach Bottom plant pressurizes instruments to reduce the chance of an inadvertent reactor trip.

risk, private companies were unwilling to participate in nuclear technology development because of the potentially bankrupting liability. Furthermore, under the specter of potential bankruptcy, would injured third parties be able to recover fully and promptly valid claims from those liable?

To solve these problems, the Price-Anderson Act was crafted. It had two central objectives: (1) to ensure prompt compensation to the public for damages stemming from a nuclear-related accident, and (2) to set a limit on the liability of private industry so that significant private sector participation in nuclear energy development would be possible. The Price-Anderson Act combines traditional tort liability under state law with a federal government indemnity.

Since its passage, the act has been modified several times with important changes to its major provisions. Amendments to the act have accomplished several things. They have closed the gaps in the original law in the protection provided to accident victims, they have extended the act's protection as new circumstances require, and they have shifted the financial burden from the government to industry.

In both 1965 and 1975, the act was extended for 10 years. Under the current law, Price-Anderson coverage applies only to nuclear power plants receiving construction permits before August 1, 1987. If Congress fails to act, Price-Anderson will expire, although its provisions would remain in force for those plants receiving permits prior to August 1, 1987.

What the Price-Anderson System Provides

Price-Anderson assures the availability of funds to compensate the public in a more complete, prompt, and certain fashion than would otherwise be possible. This system ensures that initial compensation, which might be prorated,* will be distributed more quickly than would be the case where only the liability insurance and the available resources of the reactor owner or the responsible contractor could be called upon. In addition, Price-Anderson includes the specific Congressional commitment to review the need for further compensation to provide necessary and appropriate relief if the present system does not prove adequate.

Limit on Liability

The original act limited the utilities' liability for nuclear plant accidents to the sum of available private insurance (at that time, $60 million) plus a government indemnity of $500 million, for a liability limit of $560 million. Today, the amount of privately available insurance is $160 million. Large reactor owners are required to provide the maximum amount of financial protection available, and all such owners have elected to do this by purchasing insurance from two pools of insurance companies: American Nuclear Insurers and Mutual Atomic Energy Liability Underwriters.

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*In the very unlikely event that a nuclear power plant accident causes off-site damages that exceed or appear to exceed the limit on liability, the federal court of jurisdiction would apportion the pool of funds to respond to the claims having the highest priority first. Other claimants might be able to recover only a portion of valid claims until Congress is able to review further the situation.

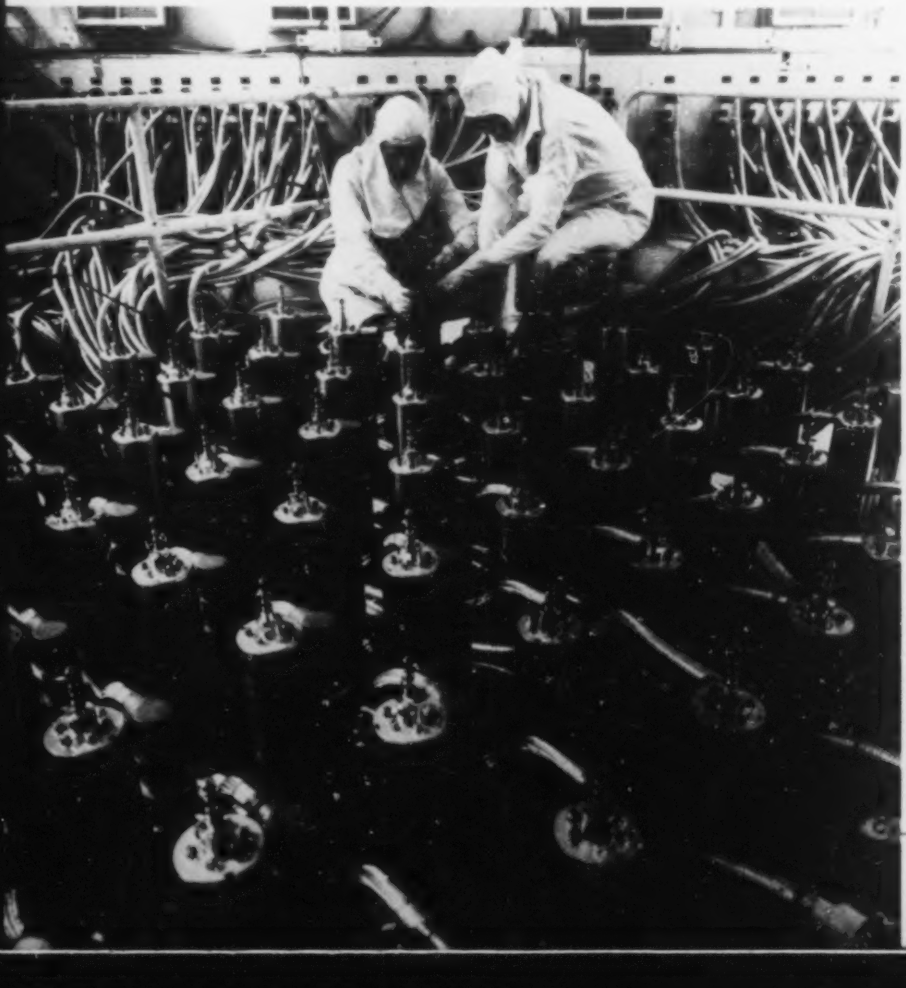
The government indemnity has been replaced by a retrospective insurance system, whereby each large reactor operator will be assessed $5 million per accident for each nuclear reactor it owns in the event damages resulting from a nuclear accident exceed the privately available insurance. It was intended that, as more reactors were licensed, the government indemnity would be phased out, and that, as the retrospective premiums exceeded $500 million, the amount of financial protection and therefore the limit on liability would rise. This is precisely what happened. In 1982, the 80th reactor was licensed, in practice eliminating the government indemnity. (If the number of nuclear reactors falls below 80, the federal indemnity will again apply.) Now, with 97 licensed reactors, the financial protection and limit on liability is $645 million. To increase further public confidence, Price-Anderson was amended in 1975 to make explicit that Congress intends to review the financial situation surrounding an accident to determine if additional arrangements are needed to compensate for losses. Therefore, while the nuclear plant owners' liability for off-site damages is limited, full compensation for victims is intended.

A principal criticism of Price-Anderson is that injured parties may not be able to obtain full recovery because of the limit on the industry's liability. But this argument misses the point. Price-Anderson balances public protection features with a cap on liability. Moreover, unlimited liability for a utility responsible for a nuclear accident does not guarantee full recovery—it simply means recovery up to the amount of funds a utility in a post-accident situation might have available for paying such claims. It is clear that claimants are much better off with Price-Anderson than without it.

Omnibus Coverage

An important feature of the Price-Anderson system is that both the private insurance and the government indemnity are "omnibus" coverages. That is, not only is the utility covered but so is anyone else who might become liable. For example, suppose that a nuclear plant accident that resulted in off-site damages was ultimately judged to have been the responsibility of a valve manufacturer. This manufacturer would be automatically covered by the nuclear liability insurance and/or indemnity agreement purchased by the reactor owner.

The omnibus feature, therefore, has several implications. In a situation where the party determined liable would under other legal principles be underinsured, uninsured or judgment-proof, the claimant would still be paid. Also, the omnibus feature provides for economic efficiency, because all contractors and suppliers, including all subtier vendors, are covered by the reactor owner's policy. This eliminates the need for insurance to be purchased by all suppliers, the cost of which would ultimately be



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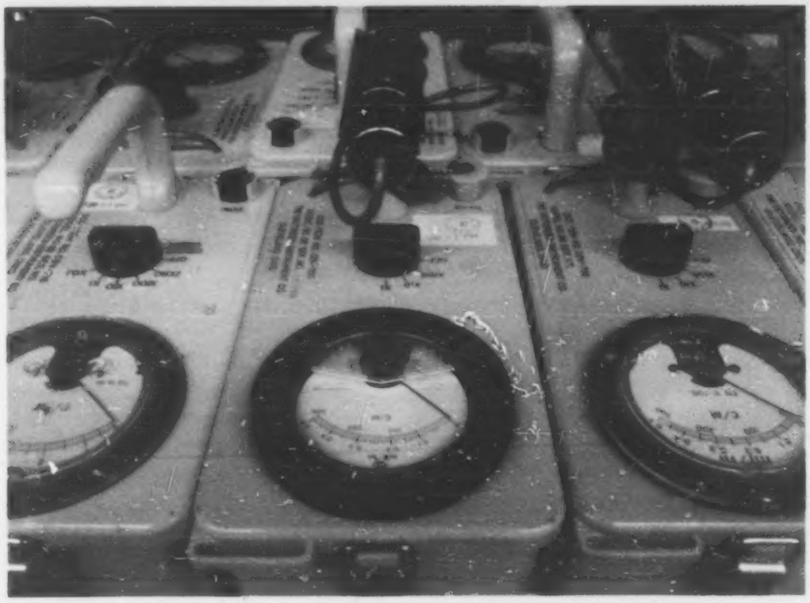
Two employees at Duke Power Company's Oconee station vent control rod drives on the reactor vessel.

Max Hirshfeld / Folio, Inc.



David M. Doody / Uniphoto

Above, left:
Property owners don't need to buy insurance for nuclear power plant accidents, thanks to Price-Anderson.

Left:
Portable radiation survey instruments are used to monitor radiation levels in plant work areas.

reflected in the cost of building a nuclear plant. Therefore, despite the unique nature of the risk from the underwriting perspective (*i.e.*, low probability, potentially high consequence, and no actuarial data), the insurance industry was able to provide what was originally an unprecedented amount of coverage. This was possible because the entire risk for a single facility was insured in a single policy, eliminating the potential for the pyramiding of claims against any num-

Georgia Power Company's Edwin I. Hatch plant units 1 and 2 began commercial operation in 1975 and 1979, respectively.

Atomic Industrial Forum

ber of parties. Although the insurance industry did not know, in the actuarial sense, the total financial risk of a nuclear power plant accident, it did know what its total exposure was for any one accident. This is as true today as it was in 1957.

Waivers of Defenses

In normal tort claim actions, the defendant has the right to put up certain legal defenses that provide obstacles to recovery that the claimant must overcome. In 1966, the Price-Anderson Act was amended to include a system of self-executing waivers of defenses that eliminates many of these obstacles to recovery. If the Nuclear Regulatory Commission (NRC) determines that an event constitutes an "extraordinary nuclear occurrence" (ENO), these waivers come into force. The criteria for determining if an event is an ENO are based on measures of radioactive release and the existence or potential for specified amounts of damage or injury. It is worth noting that the accident at Three Mile Island was determined not to be an ENO.

Property Insurance Exclusion

To maximize the amount of insurance coverage available, the insurance industry concentrates all of its available nuclear plant liability capacity in the Price-Anderson system. Consequently, all other forms of property insurance carry a nuclear exclusion.

This is by no means unique: there are a number of other exclusions in property owners' policies, including those for earthquakes, volcanic eruptions, and floods. While the Price-Anderson Act does not require the nuclear exclusion, the insurance companies, with the full knowledge of Congress, have been able to maximize coverage through this mechanism. Even without the exclusion mechanism, property owners near a nuclear facility probably would still not be able to purchase coverage. In the final analysis, insurance companies will not write policies for risks that they cannot estimate on an actuarial basis or that are subject to adverse selection by property owners.

More than likely, without Price-Anderson, some other government support mechanism would have to be devised to provide similar protection. It makes more sense to allow the insurance companies to exclude this coverage from property insurance to maximize the insurance nuclear plant owners are required to purchase on the public's behalf.

How It Worked at Three Mile Island

Although the 1979 accident at Three Mile Island taught electric utilities that they did not have enough insurance to cover their own property, the accident did not strain the Price-Anderson public compensation system. Price-Anderson worked well.

Within 24 hours after Governor Richard Thornburgh of Pennsylvania advised the precautionary evacuation of pregnant women and families with small children, the nuclear liability insurance

The soundness of the ENO concept was demonstrated by the Three Mile Island accident, which did not meet the ENO criteria but did trigger immediate payments . . .

pools opened a claims office in nearby Harrisburg to disburse emergency assistance payments. Payments of $1.2 million for travel, temporary lodging, and the like were made to 3,170 families. In addition, a total of $92,400 was paid to 636 people to cover lost wages.

The Price-Anderson procedures for sorting out and dealing with non-emergency claims also worked well. Thus far, the payments made and expenses incurred by the insurance pools total approximately $47.5 million. This amount includes payments for a class action settlement approved by the court in September 1981, which established a fund of $26 million to pay for economic loss and required payments of $5 million to create a public health fund and $14 million for individual settlements. It is worth noting that all of these payments have been made through settlements of litigation. No causation of any damages has ever been determined and no ENO was ever declared. While other suits are still pending, there is every prospect that any additional valid claims will be more than adequately covered by the private insurance layer of Price-Anderson.

Extending Price-Anderson

The starting point of the current debate on extending Price-Anderson was the December 1983 publication of the *Price-Anderson Act—The Third Decade* (NUREG-0957). This document culminated a study by NRC for Congress on the need for the extension or modification of the act. The study was required by the 1975 amendments to the act.

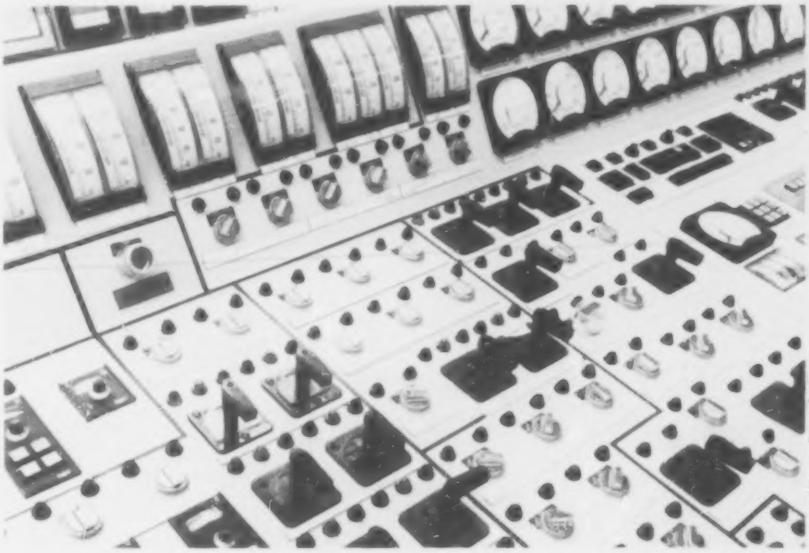
The NRC report recommends the extension of Price-Anderson to cover all future and existing plants. The electric utility and nuclear industries agree. However, antinuclear groups as well as some conservative groups (*e.g.*, American Enterprise Institute) oppose the act's extension. The conservative groups argue that Price-Anderson is inappropriate in a free market economy and that, by having Price-Anderson, the costs of nuclear power are not fully internalized. Therefore, nuclear power is not tested in the marketplace. If it were, they add, it would probably fail. These arguments miss the point of the act because they ignore the balance the act created.

Removing the Limit on Liability

Opponents of the Price-Anderson Act would like to see the limit on liability removed. The NRC has recommended that the $5 million one-time retrospective premium be increased to a $10 million annual premium that would be payable until all claims are settled. This would eliminate the absolute limit and replace it with an annual limit. The NRC report argues that this satisfies the concern of having enough funds for full compensation while eliminating the threat of bankrupting liability.

The electric utility industry opposes any removal of the absolute limit, although EEI is on record in support of increasing the one-time retrospective assessment to $15 million, bringing the limit to about $1.6 billion. Of course, where elimination of the limit on liability is discussed, it is always in terms of leaving the other Price-Anderson provisions in place. Doing so, however, would destroy the trade-off inherent in Price-Anderson that gives electric utilities a cap on liability in return for prompt public compensation and waivers of substantial rights that normally would be available under ordinary tort law. Removal of the limit on liability

To produce highly qualified personnel to run its plants, the nuclear power industry has invested heavily in training simulators.



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would destroy the balance that makes Price-Anderson work.

Increasing the Limit on Liability

Those who advocate unreasonable increases in the limit on utility liability agree that if the electric utilities require a limit on liability, then set one high enough to cover all possible eventualities. Proposals for limits range into the tens of billions of dollars. As noted above, the industry is on record as agreeing to an immediate jump in the limit to about $1.6 billion and allowing that amount to grow from there as new plants are licensed and as privately available capacity is increased.

Raising the limit beyond what can be reasonably expected from traditional financial protection mechanisms is tantamount to removing the limit altogether, because bankruptcy would occur before the limit could be reached if protection were not available. Bankruptcy would serve no one, especially the public living near the facility. This concern leads back to the issue of federal indemnity for financial protection when available resources have been exhausted. Whether additional federal indemnity will be provided must be determined by Congress. However, the 1975 amendments include Congress' specific commitment to review the situation as necessary and to consider further relief.

Retaining the ENO Concept

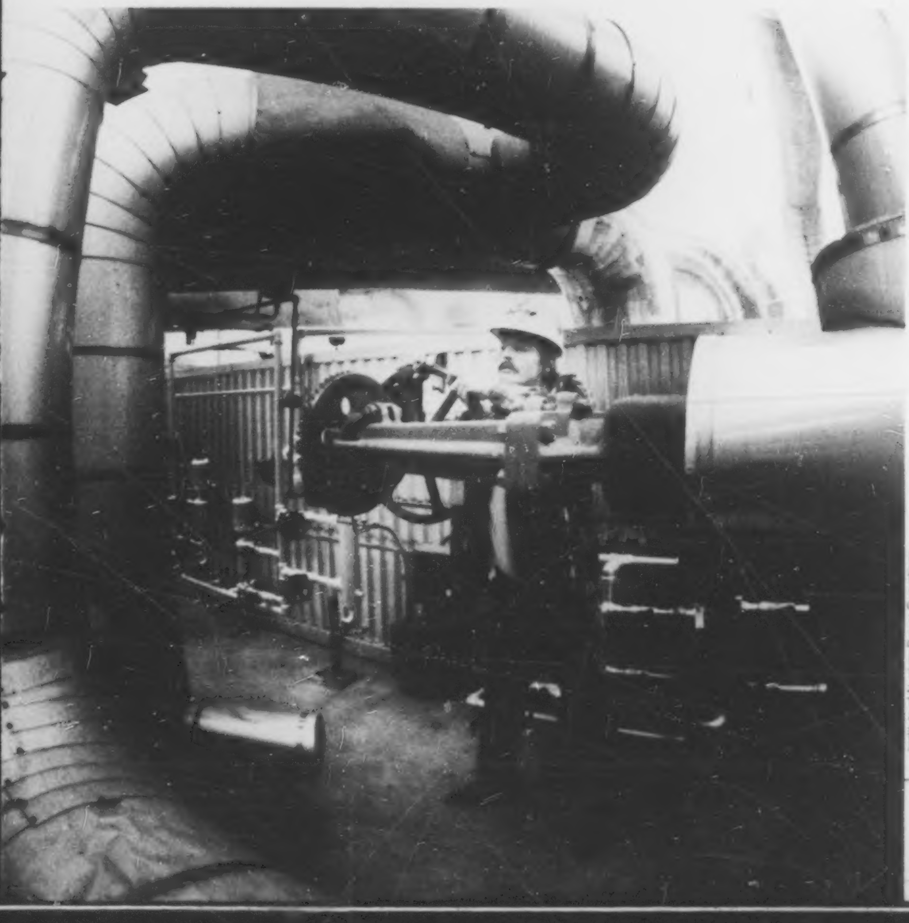
The NRC report recommends no change to the ENO statutory language. However, others have recommended that the concept be deleted and that utility waivers of legal defenses be applied to all incidents. There is no reason to eliminate this concept, however. To do so would appear to encourage individual claims that might not be meritorious and that might allege no discernible event, no exceedence of regulatory limits, no release of radioactive material, and no offsite consequences. The soundness of the ENO requirement was demonstrated by the Three Mile Island accident, which did not meet the ENO criteria but did trigger immediate payments to qualified evacuees and other claimants.

Proving Causation for Latent Injuries

Under current law, a claim for compensation for an injury is generally made pursuant to tort law or some specifically controlled action, such as workmen's compensation. Typically, a claimant must show that the alleged injury was at least 51 percent due to the actions of the defendant before compensation is awarded. In radiation injury claims, this process has resulted in lengthy court cases and conflicting opinions of experts produced by both sides of the argument.

In the past several years, proposals have been made to eliminate the tort law type of proceedings for radiation injury claims and to base awards on some sort of scientifically based determination of probable cause. Generally, proponents of this concept envision a table of radioepidemiological values that would indicate, based on a claimant's age, time since exposure, and other relevant factors, the probability for the injury (in this case, cancer) to have been caused by the exposure that resulted from the defendant's action. It is conceivable that this concept could be used under the current law. One would as-

Maintenance worker at Southern California Edison's San Onofre station tests a condensate reheater valve.



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Ebasco

Florida Power & Light Company began operating St. Lucie unit 1 in 1976 and unit 2 in 1983.

At Virginia Power's Surry plant, workers check the condition of fuel rods in the reactor core.

sume that the table would have to show a probability of causation of 51 percent or greater before compensation would be awarded. However, the proponents of this method suggest that a new scheme of injury claim compensation decisions can be developed using such a table. This scheme would move the action out of the clogged court system and would entail new laws. The insurance industry is deeply concerned about this possibility because of the potential for the new system to become politicized and for awards to be set at a much lower level of causation. Insurance industry representatives bolster their case by citing their experiences with black lung disease and asbestos exposure.

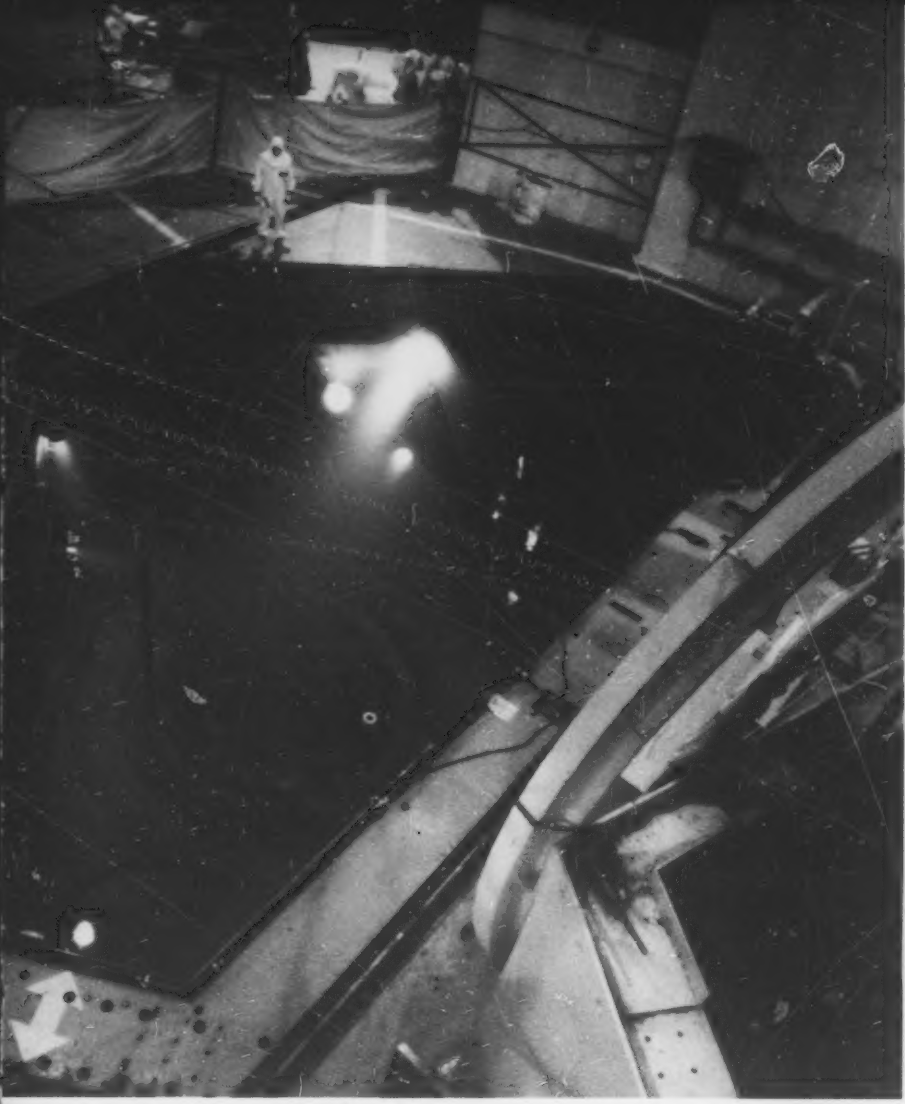
In terms of Price-Anderson, proposals have been made to include a probability of causation methodology to determine compensation, especially for latent cancers (*i.e.*, those appearing 20 years or more after the accident). The NRC report recommends that no change in Price-Anderson be made now and that the problem be further studied. EEI agrees with this recommendation.

Balancing Public and Private Needs

Price-Anderson opponents claim that the act effectively gives a large subsidy to the nuclear industry. There are several ways to answer this charge, depending on how *subsidy* is defined. If *subsidy* is defined as a payout of taxpayer funds by the federal government, then the Price-Anderson Act provides no subsidy. The federal government has never paid a penny in claims to the public. In 28 years of Price-Anderson protection, all claims have been paid by the nuclear insurance pools. Moreover, the federal government has collected indemnity fees from utilities of over $20 million, all of which has gone into the federal treasury. Thus, the federal government has been a net beneficiary under Price-Anderson.

However, if *subsidy* is defined as the establishment of a set of rules that confers special benefits on persons or groups, benefits that would not be available in the absence of such rules, then Price-Anderson is a subsidy both to the general public and to the industry. Without Price-Anderson, claimants would have to overcome substantial obstacles to recovery posed by ordinary tort law, and the industry would not have predictable levels of liability.

On this point, in 1978, the U.S. Supreme Court not only upheld the constitutionality of Price-Anderson, but also recognized that through the act Congress had put potential claimants in a better position to be covered for the full spec-



Timothy Wright/Virginia Power

Electric Power Research Institute

A manual control lever is a back-up to the usual automatic raising and lowering of fuel rods.

trum of potential nuclear-related accidents than if those claimants had been left to conventional tort remedies and to the financial capacity of those persons liable.* The Supreme Court concluded that the public receives substantial benefits from Price-Anderson. Under the act, claimants can expect to receive full compensation in all but the most serious accidents. Even in large accidents, however, substantial funds would be available for immediate needs. Moreover, Congress has pledged to provide any additional compensation that might be warranted. In effect, the Supreme Court recognized that, while the Price-Anderson Act limits liability, it does not limit public compensation.

Finally, in a nation as large as the United States and in an economy so complex and rapidly changing, it is not surprising that federal and state governments are involved in many areas of public life. The federal government, for example, operates insurance-type mechanisms for crops, floods, banks, savings and loan associations, home mortgages, social security, Medicare, crime, and maritime losses. Moreover, a number of laws provide for a limitation of liability, including those for oil spills, federal bankruptcy, workmen's compensation, medical malpractice, and even parental liability for acts by children.

Maintaining the Property Owners' Exclusion

Opponents of Price-Anderson insurance also say that the nuclear exclusion in property insurance pushes the economic burden of an accident onto the property owners near a nuclear facility. As cited above, the exclusion is a part of the system that maximizes financial protection.

The Political Landscape

The principal point of contention in the debate over the Price-Anderson Act is the level of the limit on liability. All parties seem to agree that the current liability limit is too low. The industry has expressed strong support for a simple extension of the act that would also increase the retrospective assessment to $15 million per reactor. This change would immediately increase the protection for the public to about $1.6 billion. This proposal, although with an increase to only

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**Carolina Environmental Study Group, Inc. v. United States Atomic Energy Commission*, 431 F. SUPP 203 (W.D.N.C. 1977), *rev'd sub nom. Duke Power Company v. Carolina Environmental Study Group, Inc.*, 438 U.S. 59 (1978).

$10 million per accident, is contained in H.R. 51, introduced by Representative Melvin Price, one of the sponsors of the original bill.

Several other proposals seek either higher limits or the removal of the limits. Senator Gary Hart and Representative John Seiberling have proposed companion legislation (S./H.R. 445) that would, among other things, eliminate the limits. This proposal enjoys the support of the antinuclear community. Then there is the 1983 NRC report that proposes to eliminate the absolute limit and replace it with an annual limit, which is just unlimited liability by another name; Senator Robert Stafford introduced legislation based on the NRC report's proposal. The NRC itself is split 3-to-2 on this issue. (Chairman Nunzio Palladino and Commissioner James Asselstine support the report's recommendation, while Commissioners Frederick Bernthal, Thomas Roberts, and Lando Zech support an absolute limit.)

Representative Morris Udall, a key figure in any debate on nuclear legislation, circulated a proposal that called for a liability limit of $15 billion, with the first $4 billion to come from the utility financially responsible for the accident and the balance to be funded by the remainder of the nuclear utilities at a rate of $10 million per year per reactor. This is an obvious example of a limit that is so high that it is not a limit at all.

Other than the Price bill, the most reasonable approach thus far has been proposed by Senators Robert Dole, Alan Simpson, and James McClure. The Dole-

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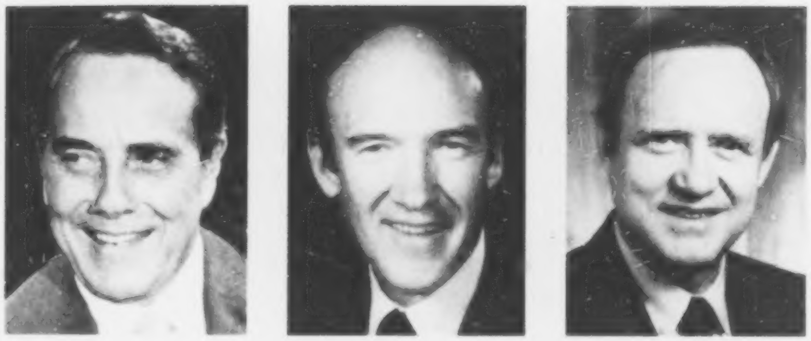
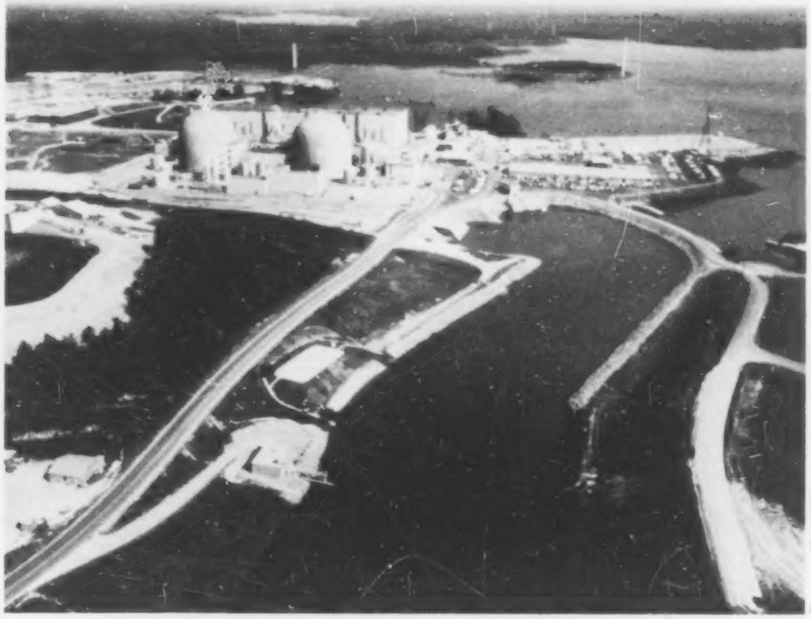
During an emergency exercise, a chemistry and radiation protection technician wheels a shielded cask containing an air sample from the containment building at Portland General Electric's Trojan plant.



Senators Robert Dole (left), Alan Simpson (center), and James McClure (right) offer a reasonable proposal to renew and improve the Price-Anderson Act.



Bob Jones/Virginia Power

In 1984, Virginia Power's North Anna station units 1 and 2 produced 8.5 million megawatt-hours of electricity.

Simpson-McClure bill (S. 1225) increases the retrospective assessment to $15 million per reactor per accident and adds a third layer of $500 million to be funded by a post-accident tax of one mill per kilowatt-hour on all nuclear generation of electricity. The Dole-Simpson-McClure bill also has the considerable advantage of greatly strengthening the congressional promise to review an accident and to provide for the victims if damages exceed available financial protection. The proposal could be a reasonable approach to extending the act if it is modified to eliminate the proposed third layer plus some other changes regarding how the legislation treats the Department of Energy's nuclear waste program. If S. 1225 is not modified, it may impose a greater burden on electric company ratepayers and stockholders than the utilities would be willing to accept.

The Future Without Price-Anderson

What will happen if Price-Anderson is not renewed? It is not very clear. It will depend on the form nonrenewal takes. Congress could repeal the act altogether, which would result in all manner of legal and constitutional questions that would have to be resolved. Fortunately, there appears to be general agreement that without some federal financial protection plan, the legal situation would be chaotic and would achieve none of the original goals of the act, including the financial protection of the public.

Congress could, however, allow the act to expire on its own but remain in force for plants that receive construction permits before August 1, 1987, which includes all plants in operation and under construction today. The electric utility industry is also considering this possibility, but only as a remote one. The Price-Anderson Act, with its no-fault nuclear liability insurance system, is a key element in a functioning nuclear energy program in the United States. If this nation is to have a nuclear energy program in the future, it must also have the Price-Anderson Act. However, if the only alternatives for extension are those that so alter the fundamental concepts of the act so that the act becomes unacceptable to the electric power industry, the industry might be forced to take the position that expiration is appropriate.

As Congress climbs through the thicket of issues surrounding the Price-Anderson debate, the electric utility industry hopes that the wisdom of the act will win out. EP

John S. Carter

Bring Back The Ole Fishin' Hole

Liming is a fast, cost-effective way to restore the acid balance in lakes and streams.

George Fuge and a small band of Adirondack fishermen weren't interested in why Middle Sergeant Pond was acidic. They just wanted to catch trout. So, they took the initiative, paid for tons of ground limestone out of their own pockets, backpacked it two miles through the woods, spread it on the lake from their canoes, and now point with pride to one of the area's finest fishing holes.

Liming is an inexpensive, reliable method of raising the pH in acidified lakes. It has been used around the country since the 1940s when it was introduced to enhance fish populations in bog waters. Today, farmers in the United States use more than 30 million tons of crushed limestone a year to control soil acidification caused by nitrogen fertilizers. Limestone is commonly used to treat water affected by acid mine damage.

There is growing interest among fishermen and state environmental officials in neutralizing acidified lakes and streams, and they are turning to liming as a strategy to create water conditions that will support fish. This lake and stream restoration method, tailored to specific sites, is an excellent way of quickly and cost-effectively mitigating acidification. Excess acidity can be eliminated in less than a week and for as little as $10 an acre.

"Why watch lakes deteriorate when we can do something?" Fuge says about his group's decision to move ahead with the liming of 24-acre Middle Sergeant Pond in Hamilton County near Raquette Lake, New York. "Our economy is based on fishing. If people come up here and don't catch anything, they won't come back. We can't sit around and watch these ponds die."

Fuge, a retired college administrator, now heads New York's Volunteer Lake Liming Task Force, which helps volunteers connect with state experts who guide the liming of acidified lakes and stocking them with fish. The task force has overseen six successful liming projects.

Though some believe that acid rain is responsible for Adirondack lake acidification, a new round of research raises doubts about this theory. New studies implicate the natural acidity found in the runoff from decomposing organic material on the forest floor.

Whatever the cause, excess acidification can lead to altered growth rates, reproductive failure, and even death for fish. Liming selected lakes and streams is the fastest and most direct way to deal with the problem. Addition of alkaline materials, such as limestone, restores lake fisheries more assuredly than attempts to control the sources of acidity.

Fuge and his friends knew they had to act to help bring back good trout fishing in their beloved Adirondack Mountains. So, while scientists pondered the acidification question, Fuge's group tried liming. "Liming is not the ultimate solution because you have to lime again and again, but we don't know how long it would take a lake to recover if left on its own."

John S. Carter is a journalist specializing in environmental issues.

Liming Catches On

Volunteers were equally as hard working and equally as successful in nearby Fulton County where Holmes Lake was brought back as a productive fishery through the addition of limestone. Holmes is a small, 19-acre lake about a mile from the nearest road, according to Larry Nashett, senior aquatic biologist for the New York Department of Environmental Conservation and supervisor of the Holmes project.

Before the liming began, Nashett surveyed the lake and found no fish. Volunteers spread 20 tons of lime, and the buffering agent reduced the acid level within a week. That fall the lake was stocked, and the following year a survey found a thriving fish population. "It was quite a turnaround. We saw loons flying and a heron, too, which must have been feeding off the fish," he said.

The New York volunteer task force carefully screens candidate lakes for the liming program, looking for "unique or extremely valuable aquatic resources." If a lake is selected, the volunteers doing the liming must agree to monitor the water's acidity indefinitely and to add more lime if conditions warrant. "We don't want them to stop; they must agree to maintain the lake," Nashett said. So the New York project moves ahead slowly, but with plenty of positive results.

Although applying ground limestone is a proven method of neutralizing acidity, New York, West Virginia, and Massachusetts are the only three states with liming

Robert Seven/Edison Electric Institute

New York's six-million-acre Adirondack Park is a wilderness of mountains, lakes, and streams. Visitors enjoy sport fishing, but some say it isn't as good as it used to be.

programs. Minnesota, Michigan, Pennsylvania, Rhode Island, Vermont, and Wisconsin are considering future liming programs.

New York has the largest ongoing liming effort. From 1959 to 1963, 19 acidified bog and kettle ponds were treated with hydrated lime. From 1964 to 1983, 56 ponds were treated during the state's second liming phase, which overlapped the volunteer liming effort. A third phase, during which 33 waters will be limed, is expected to conclude in 1989. In Massachusetts, experimental liming has been conducted for 28 years. In the last three years, the state limed 19 ponds covering 1,024 acres and expects to have limed an additional 4,000 acres by the end of 1985. West Virginia limes two small trout ponds and an acidified stream.

A sampling of these various liming efforts indicates that costs have ranged from $10 to $170 an acre depending on the remoteness of the lake. The amount of lime used also has varied, ranging from 360 pounds per acre to 2,000 pounds per acre.

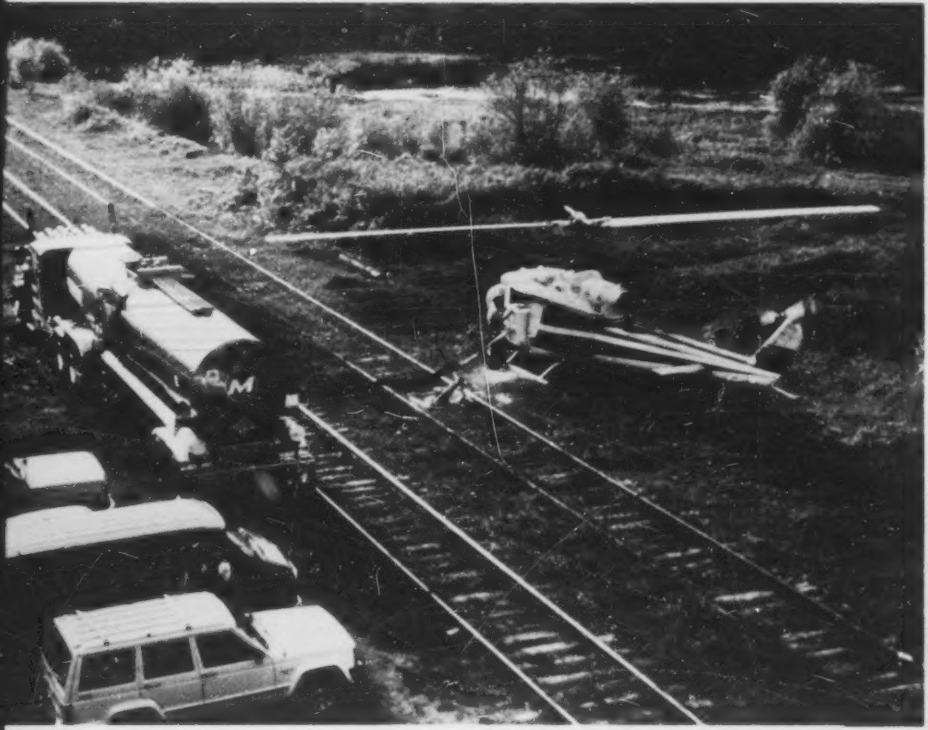
Research on Three Lakes

Beyond these state efforts, the Electric Power Research Institute (EPRI) is investing in more precise liming research with its three-year Lake Acidification Mitigation Project (LAMP). Appropriate techniques for liming, amounts of material to use, and the long-term consequences of application are not well-known. EPRI felt the industry needed better scientific data, according to Don Porcella, LAMP manager.

"Nothing had been quantified," Porcella said. Other researchers have "answered the question of whether it worked, but it was all qualitative. We are trying to determine quantitatively the effects of liming," he said. The experiment is expected to show how much lime is needed for various sizes of lakes and how quickly a lake will reacidify after treatment.

Three Adirondack lakes were selected for study: Woods Lake and Cranberry Pond in Herkimer County and Little Simon Pond in Franklin County. "We chose these three lakes because they have been studied in the past for other experiments, and there was a large data base available in advance." They also have differing characteristics.

EPRI's Lake Acidification Mitigation Project: Left, ground limestone is pumped into the helicopter that will spray the material on Woods Lake and Cranberry Pond. Right, Dr. Steven Gloss, a fisheries biologist at Cornell University, puts an identification tag on a trout's lip; after spending some time in the limed lake, the trout will be captured and its growth and body chemistry analyzed.



Jack Henemann/General Research Corporation

Don Porcella/Electric Power Research Institute

"We wanted a range of sizes and flushing rates," he explained.

Cranberry, at 12 acres, is the smallest and the quickest to replace its water. Woods is the next largest at 60 acres and has a moderate flushing rate. Little Simon Pond is 165 acres, and a water molecule could take two years from entering the lake to pass out again. Cranberry has never supported a fish population, Woods' fish population recently began to decline, and Little Simon has a declining population, Porcella said.

The two smaller lakes were limed in May 1985 (Little Simon won't be limed until next year), and after only four months the results are encouraging. The early results show that the stocked fish are thriving, said Porcella, "but, we are looking at other things. We want to know how the lime will interact with sediment on the lake bottom, possibly prolonging the time before lime needs to be reapplied." The experiment also hopes to show how frequently lakes must be treated. Porcella said he is hoping that "we'll be able to predict water quality" in a lake to be treated before the lime is added.

Unlike the groups of Adirondack volunteers, EPRI used a helicopter to spread the 46 tons of lime which had been mixed with water. It took 40 helicopter trips to spray the mixture over the two lakes.

The Swedish Story

But it is in Sweden that the world's most massive liming program goes on. The National Swedish Liming Project was prompted by pressure from politicians and the public. "It was in 1965 that we saw the first signs of reduced fish populations. More and more information was gathered and public opinion mounted, so Parliament passed the five-year trial program," explained Dr. Bo Bengtsson, head of the project.

Ed Castle

Ed Castle

Bengtsson (top) and Nyberg (bottom): The Swedish government is liming 3,000 lakes in a multi-million-dollar program, the world's biggest.

About 1,500 lakes and streams were treated at a cost to the Swedish government of $12 million. As a result of the program's success, Swedish authorities decided to go into full scale liming. Of the nation's 90,000 lakes, Bengtsson estimates 19,000 are threatened with acidification and 3,000 are being actively limed.

Unlike American liming projects, the Swedes did little restocking after restoring normal pH levels. "Certain species were already wiped out . . . but in lakes where we were successful in raising the pH, the population of fish grew. Of the fish we looked at, their size and growth rate improved," Bengtsson said. The productivity of the fish was restored by the liming, according to Dr. Per Nyberg, Bengtsson's colleague and a research scientist for the Swedish National Board of Fisheries. "They reproduced as they should," he said.

Nyberg and Bengtsson visited the United States recently at the invitation of Edison Electric Institute (EEI) to share their knowledge with representatives of U.S. electric utilities. One of the discoveries in the Swedish project was that acidity is not solely responsible for the death of fish. Metals, such as aluminum, dissolve in acidic water, accumulate in fish, and finally cause their deaths. "Iron, manganese, and aluminum go into solution in the presence of acid. Aluminum caused 95 percent of the fish mortality," said Nyberg.

The Swedes also found that liming needs to be repeated depending on the lake's flushing rate, the frequency with which all the lake's water is replaced from outside sources. They lime at half the flushing rate or once every other time the lake's water is completely replaced. Streams are limed continuously. "Some lakes take once every 10 years, but on the average it's once every two years," Nyberg said.

Several alkaline materials are used to neutralize acidified waters, such as hydrated lime and quicklime, but limestone is the most common. It is easy to handle, noncaustic, inexpensive, and easily distributed and is a natural component of water buffering systems. The Swedes chose limestone. "It's available all over Sweden. It's easy and convenient to apply," Bengtsson said.

The Swedes found "there was no difference among the times of the year to apply the lime," though they tended to choose either the fall or spring to avoid interfering with summer vacationers. The cost is

Don Porcella/Electric Power Research Institute

The LAMP helicopter spread 46 tons of lime on the two Adirondack lakes.

Al Messerschmidt/Folio, Inc.

Research now indicates that fish decline may be caused by run-off from decomposing organic materials in the forest floor.

shared between the government and lake owners on a 85 percent/15 percent basis. In return for accepting the government aid, property owners had to agree to allow the public to use their lake or stream.

Like Fuge and his volunteers, Nyberg realizes that liming is not a permanent solution. "Liming won't lower emissions. It is just a pill. But we are working on emissions, and that will take time."

What Causes Acidity?

Though temporary, lake liming is a fast and dependable means of controlling acidification as research continues on its underlying causes. Millions of dollars have been spent in recent years to determine the causes of acidification, and one of the clearest results is that acid rain is not first among them.

Robert Seven/Edison Electric Institute

More and more scientists are saying that acidity in rainfall has remained stable, despite major reductions in industrial emissions.

Many environmentalists believe that the burning of fossil fuels in power plants, steel mills, and automobiles releases nitrogen and sulfur into the air where they undergo complex chemical changes to become acids that rain down on sensitive environments, damaging trees and aquatic life. This vision of life-giving rain turned into acid showers became etched in the mind of the American public in the early 1970s when environmental issues first emerged.

New research has prompted rethinking of this scenario, and a growing number of scientists now believe that rain is not getting more acidic. In fact, studies now indicate that acidity in rainfall has remained stable, despite significant reductions in industrial emissions, and the death of some ponds is more likely due to run-off from the decomposition of organic materials on the forest floor. The Swedes found that the metals building up in the fish came from forest soils and were being leeched out by the acid byproducts of organic decomposition.

The first step in understanding acidification is learning about pH, the scientific scale which ranges from zero, the most acidic, to 14, the most alkaline. The abbreviation pH is shorthand for hydrogen ions present in a solution. More hydrogen ions in a solution make it more acidic, less make it more alkaline. The pH scale is exponential: each number on the scale means a tenfold difference from the next. Thus, a solution that measures pH 4 is ten times more acidic than a solution that measures pH 5.

Rainfall is a complex chemical broth that includes much more than condensed water vapor. It rarely registers neutral on the pH scale. Normal rainwater is about 5.2 on the pH scale and frequently can be more acidic depending on conditions. Droplets form around solid particles, often dust containing calcium and magnesium, and absorb chemicals in the air. Those which cause it to become acidic include sulfates and nitrates.

Sulfates and nitrates come from natural sources as well as human activity. Bacteria in the soil and in surface waters, volcanoes, and geysers produce volatile sulfur. The sulfur in fossil fuels is converted to a gas—sulfur dioxide—when coal and oil are burned. Nitrogen compounds are produced by decaying organic matter and bacterial activity in soil. Forest fires and crop burning add to the nitrogen, as does lightning.

That rain is acidified from natural sources sheds light on findings of particularly low pH readings in rain from such undeveloped areas as the Amazon River jungle and remote beaches of Hawaii.

While airborne chemicals acidify rain, an equally important source of acidity in lakes is the forest floor, scientists agree. A study of the organic soil layer in the Adirondacks found acidities of pH 3.5, a reading at least five times more acidic than the rainfall. A 1982 report by the Office of Technology Assessment of the U.S. Congress found that "the amount of acidifying material that actually enters a given lake or stream is determined primarily by soil and geologic conditions of the surrounding watershed."

"Consider grape juice as an analogy," suggests Alan W. Katzenstein, an EEI consultant in technical analysis and communication. "It starts out sweet, then over time it becomes alcoholic and finally wine vinegar. The same is true of cider. It goes from soft to hard to vinegar. The end product of biological decomposition of vegetable matter, including twigs, needles, and leaves, is acidic.

Part of the environmentalists' theory of acid rain is that it has gotten worse over the past three decades. Now, many scientists think otherwise. Data gathered in the 1950s is sparse and of questionable quality. Abnormally high alkaline dust levels in the air and primitive methods of measuring pH may account for high pH (more alkaline) readings at the time; no trend can be claimed based on them. More recently, more sophisticated sampling and analysis techniques have been producing better data, data which indicates that there has been no increase *or* decrease in rain's acidity in the past 10 to 15 years.

Putting the Puzzle Together

Understanding the causes and effects of acidity in the air and on the ground continues to be the goal of extensive research. EPRI has spent more than $32 million in the last seven years to study acidification, and more than $75 million is targeted for future work. In the federal government, nearly a dozen agencies are tackling pieces of the puzzle. More than $197 million has been spent already, and another $81.5 million has been committed.

One of the biggest federal projects is an Environmental Protection Agency (EPA) survey of 1,619 lakes in the East and upper Midwest. Early data has caused some shaking heads in the scientific community: Florida was found to have the greatest number of acidic lakes, not the Northeast which has drawn so much attention. The survey's purpose is to determine baseline acidity and buffering capacity of lakes and to measure the effects of acidification. The results showed that 20 percent of Florida lakes had greater than expected acidity, the highest percentage among regions surveyed.

The survey also found that the Northeast region had the largest percentage of lakes sensitive to acidification. These "low buffering capacity" lakes make up 60 percent of the Northeast lakes, but only 36 percent of the southern Appalachian lakes. EPA officials are moving into the second phase of the survey in which they will collect more detailed data on fewer lakes to determine how acidity changes over time. The goal is to find those lakes which face the greatest risk of harmful acidification.

Robert Seven–Edison Electric Institute

In LAMP thus far, stocked trout are thriving.

As both private industry and government seek firm answers about acid rain and how lake liming can be used to mitigate acidification, electric utilities continue to work hard to reduce the amount of acidic materials entering the atmosphere.

Electric utilities are aggressively pursuing clean coal technology, which allows their power plants to burn coal more cleanly than ever—with 90 to 99 percent of its potentially polluting sulfur content removed. In addition, clean coal technology offers the advantages of less solid waste, lower overall cost, and improved efficiency.

These techniques include coal gasification in which the coal is converted into a clean burning gas. Fluidized bed combustion mixes finely ground coal with limestone on a bed of air, drawing the sulfur out of the coal. Scrubbers, which clean sulfur oxides from flue gases, are in use on 120 generating units. Utilities are also working to clean the coal before it enters the combustion chamber by grinding the material more finely and separating out impurities.

The cost of cutting sulfur emissions has been staggering. EPA estimates that electric utilities have spent $11 billion in pollution control equipment since 1970 and have accumulated $42 billion in annual costs for capital, operation, maintenance, and purchase of low sulfur coal. Between 1981 and 1990, EPA estimates that an additional $26 billion will be invested by utilities nationwide. Their accumulated annual costs in the next decade will approach $96 billion.

Improvements in air quality have been dramatic. Since 1973, sulfur oxide emissions are down 28 percent, and those attributed to power plants are down 19 percent. These decreases have come even though the use of coal to generate electricity is up 60 percent. But even these dramatic improvements in air quality won't help an acidified pond.

If You Want Fish, Lime

The Swedes found that, left on its own, nature takes too long to restore the acid balance in a lake. Instead, an active campaign of neutralization should be undertaken and the pH level maintained in order to keep the fish around. So, people like George Fuge lean toward restoring favorite fishing spots with a cheap, easy method that works—liming. ▰

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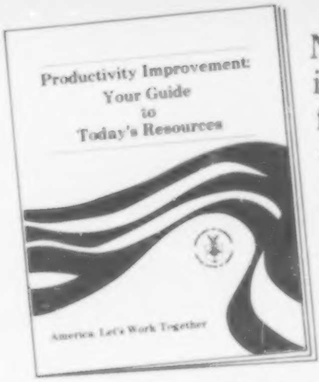

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Robert MacNeil

The Media and The Public Trust

Americans are disgusted with the news media and want to bring it to heel.

This article is based on a presentation by Robert MacNeil on June 12, 1985, at the 53rd Annual Convention of Edison Electric Institute in Denver, Colorado. Robert MacNeil has been executive editor and co-anchor of "The MacNeil-Lehrer NewsHour" (formerly "The MacNeil-Lehrer Report") since its inception in 1975. The weeknightly television series has won several major broadcast journalism awards, including two Emmy Awards, the George Foster Peabody Award, and the Alfred I. Dupont/Columbia University Award.

If I were in your shoes, one of the things that might concern me today would be how to communicate to the American public through the filter of the mass media. If you were in my shoes you might be concerned about how to be serious and how to be fair in an environment when your competition often seems to be a lot more successful not worrying about seriousness or fairness.

It seems to me that the difficulty of being fair and serious in today's competitive media world is one of the realities behind the present friction between the news media and the public. Let me explain.

There is a pretty general feeling in the news media at present that their relations with the public are in something like a crisis state.

Just how grave the situation is and what, if anything, should be done about it, is a matter of debate. But there is plenty of evidence that it is grave, evidence that the public trust is an ebbing tide.

There is the large number of libel suits, a growing trend for juries to find against journalist defendants and to award huge damages to the plaintiffs. They are not always upheld on appeal but they reveal an attitude. Eugene Patterson, editor of the *St. Petersburg Times*, says, "Juries are the American people. They want to punish us."

Then there are the megaton libel suits, like General William Westmoreland's, Ariel Sharon's and Senator Paul Laxalt's, brought, the media defendants believe, with punitive or intimidating intent.

There are the opinion surveys which can be read to indicate some decline in public confidence, or can be read the other way. The glass can often seem two-thirds full and one-third empty. The findings are inconsistent and sometimes contradictory.

They also show distressing assumptions about what government could or should do to the press and amazing ignorance of the First Amendment—all coupled with a general applause for the abstract idea of a free press.

There is a proliferation of groups of aroused citizens wanting to discipline or curb or regulate journalists. One of them, Fairness In Media, was trying to buy equity control of CBS to become Dan Rather's boss and is now applauding Ted Turner's takeover bid.

There is an unquantifiable, but, to all of us working in the media, evident spirit of rancor abroad in the land. When the Reagan Administration initially excluded the press from Grenada, and the public applauded, *Time* magazine reported that its letters ran eight-to-one against the press and the opposition "was expressed in gleeful, even vengeful terms."

David Gergen, then White House communications director, commented, "Unfortunately, kicking the press is a sure-fire applause line with almost any audience."

So, why, editors began to ask, do they hate us?

Survey after survey shows specific irritants turning up consistently. Significant parts of the public—minorities, true, but large minorities—think the media are often inaccurate, unfair, biased, intrusive of privacy, unethical, arrogant, and preoccupied with bad news.

It is a verdict pretty well summed up in a pop song "Dirty Linen," sung by Don Henley:

Dirty little secrets
Dirty little lies
We got our dirty little fingers
In everybody's pie.
We love to cut you down to size.

And the refrain:

Kick 'em when they're up
Kick 'em when they're down.

And there is the Anne Murray song:

There's a local paper rolled up in a rubber band.
One more sad story's one more than I can stand.
Just once how I'd like to see the headlines say:
'Not much to print today,
Couldn't find nothin' bad to say.'

And the bulletin of the American Society of Newspaper Editors, which printed those songs, also

J. L. Allen/Tugrie

MacNeil wonders, how much longer will journalists get away with arrogance and sloppiness?

pointed out that in novels, plays, movies, and television shows recently, the public sees journalists in a very unfavorable light.

Why do they hate us?

Daniel Schorr, until recently chief correspondent of Cable News Network, said last year, "The words 'power of the press' always carried a white hat connotation of power exercised for good. But 'power of the media' has a black hat sound of power exercised against people."

According to opinion surveys, many Americans resented the behavior of some television crews intruding on the grief of bereaved families after the Marine barracks were blown up in Lebanon. The public seems to discount the defense of journalists that some such families find release and catharsis in exposing their grief.

I remember very hesitantly approaching the father of a boy killed in Vietnam for permission to film his funeral. His son's name was Ron. He said he was glad: "It will give Ron's death some meaning."

People felt like that after Lebanon. But the public remembers the crews that staked out houses and filmed as Marine officers delivered the news of a loved one's death. The public remembers the shrieks. The public may even want to hear them and then feel ashamed of voyeurism.

When the *Washington Post* returned a Pulitzer Prize because its young reporter, Janet Cooke, confessed to inventing an eight-year-old heroin addict, 61 percent of Americans sampled by Gallup said they believed "very little" or "only some" of the news we print or broadcast. Only 33 percent said they believed most news reports.

Why do they hate us?

Some thoughtful journalists suggest we may have been wearing the First Amendment too brazenly, not as a shield, but as a challenge.

Robert MacNeil

Perhaps reporters feel the climate of the time requires that they sound hostile so that they will appear tough.

Michael O'Neill, former editor of *The New York Daily News,* said two years ago, "We have to be careful not to claim more than we have a right to claim in the public interest. After all, it is the public's interest, not ours."

Lou Boccardi, president of the Associated Press, points out that the media occupy a different place in this society than they used to and he wonders, "Have we reached a point where we must recognize an obligation not to do some of the things the First Amendment gives us every right to do?"

Many other explanations are offered, for example, that we are the purveyors of bad news.

Some think that journalism, the media, has become just another big institution, like the others Americans suspect of too much power. Interestingly, the surveys often show that people love their local paper or news show, but hate newspapers or television in general.

Everyone in the media has his own explanation for what is going on, and I would like to offer a partial explanation of my own this afternoon.

I believe that there is a rising public expectation of fairness, that a higher standard of fairness is demanded of our profession now than in the old days when journalism was local, pointed, and hot. The rise of a national journalism has long ago cooled off the partisanship. The days have gone when a paper like the *Los Angeles Times* could deny access to political opponents. The trend today is to open up access, to broaden the range of views printed.

From the beginning, broadcasters, using limited public airways, could not be sharply partisan, first out of practicality, later by regulation. Some feel that broadcasters, who have influenced print in so many other ways, thus created expectations of fairness among readers and that made newspapers more objective, as did declining competition and probably a better educated public.

Fairness—even-handedness, balance, objectivity—is the demand I hear more consistently from the public than anything else, and the greatest complaint I hear is lack of it. The public defines fairness very broadly and is spurred on by people with axes to grind who want to define fairness their own way.

I see a danger that unless the journalism profession redefines fairness and its importance to us, others will increasingly try to define it for us—and perhaps succeed.

I see a number of ways in which the news media today may be unconsciously working against fairness, or stimulating a public perception of unfairness.

I think there is, frankly, scorn for fairness in some quarters. It may be left over from the new journalism, which died because it excused mediocre practitioners from the drudgery of gathering facts, and because people got tired of reality filtered through perceptions no more interesting than their own. In some quarters, it is clearly a yearning for straight advocacy journalism, which regards fairness as effete and unmanly and thinks telling both sides of a story and letting the public decide the merits is wimpy and even irresponsible.

There is an attitude common in the media that any good journalist can apply common sense and quickly fathom what is right and what is wrong in any complicated issue and that professional pride demands that he say so. The targets of this often facile journalism—the company, the school, the military, the hospital—see the superficiality, the shallowness of the story and consider it unfair.

Coupled with this attitude is one in which a reporter or a camera crew act as though their presence, their action in covering a story, is more important than the event they are covering. People love that!

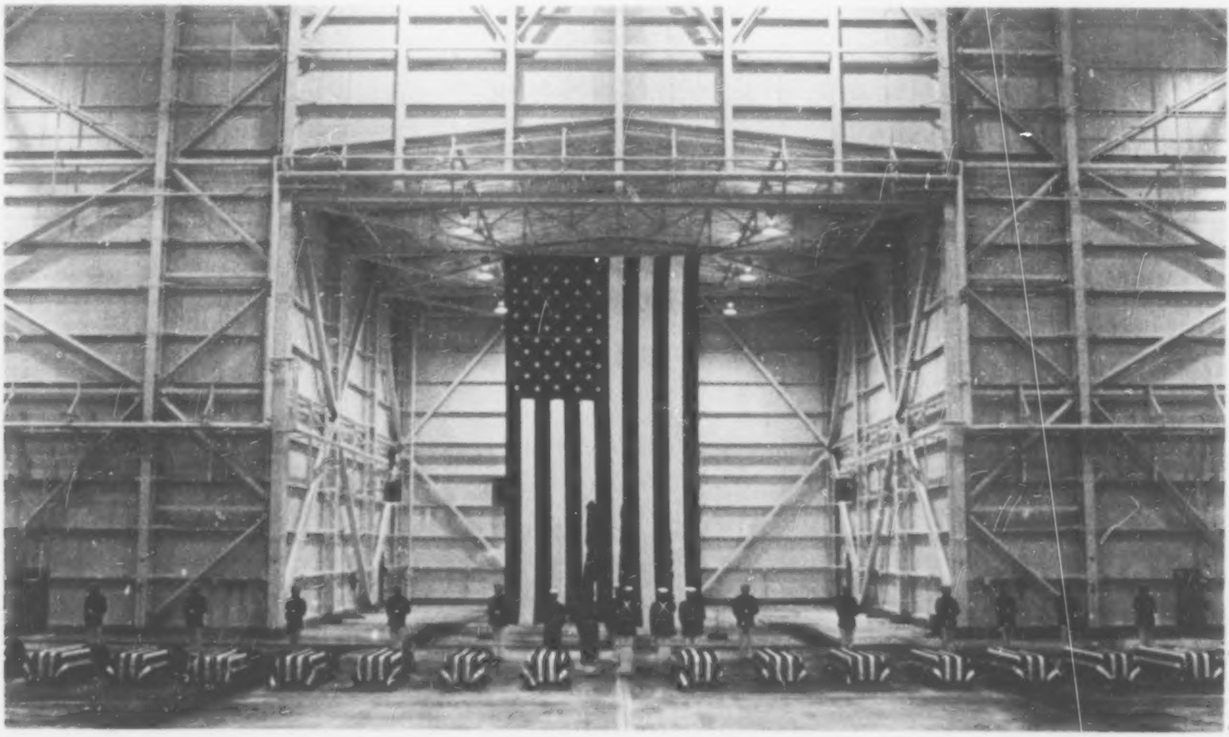
Then there is the more cynical belief that the American public loves the myths of good guys and bad guys and wants the real world fitted into such molds, so someone always has to be the bad guy.

I also see what the public may perceive as unfairness in the aggressive negativism, sometimes of a rather theatrical, posturing kind, that has pervaded so much reporting, especially from Washington, since Vietnam and Watergate. It is as though the media had not yet digested these events but still felt obliged to duel with ghosts.

There is a difference between skepticism and disbelief. It is true that all the icons of our beliefs trembled on the walls in the decade from 1965 to 1975. Scarcely an institution went untouched. Most of them have been rehabilitated in the public mind, including the presidency.

Yet in Washington, I feel that some media representatives are continuing to act out a ritual hostility learned when they thought government was lying to them every day about virtually everything. It

Bodies of Marines, killed when their barracks in Beirut were blown up, arrive in the U.S. Television cameras recorded the screams when families first learned of their sons' or husbands' deaths.



Tannenbaum/Sygma

may have started as a collective professional attitude of "Boy, they're never going to pull the wool over our eyes again."

It may be frustration over their increasingly smooth manipulation by recent administrations.

It may be the influence of television exposure, which feeds on adversarial confrontation. Never ignore how the values fashionable in entertainment programs inform the journalistic end of the medium. All television gravitates towards drama, and what passes for drama is often belligerence, people barking at each other, like soap opera actors, sounding vehement to make up for cardboard characters or too little rehearsal time.

So we have the media sounding vehement, belligerent, barking at President Reagan, who responds by grinning ruefully. Who is going to win that kind of contest?

Perhaps reporters feel the climate of the time requires that they sound hostile so that they will appear to be tough.

But what if that merely feeds a perception the surveys show that the press is simply being rude—in the words of a Citizens Choice study, being "too hard" on government, in this case the president. What if the effect is to substitute in the public mind, and perhaps in the press' own, this rather theatrical toughness for the real thing?

Few people in the business think the news media are tougher on this president than on his recent predecessors. Yet the public thinks so. They think we are picking on him. So we may be reinforcing public perception of unfairness without

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Viet Cong fighters parade in triumph in Saigon. "The Vietnam Deception: The Uncounted Enemy" told television viewers that General Westmoreland cooked the books on enemy troop strength.

J. Pavlovsky/Sygma

any corresponding trenchancy to back it up. It would be like being hanged for rape when the only crime was a little necking.

But another effect could be to strengthen the hand of government, any administration, in manipulating the media, to have the public think that we are unfair to government.

It must be puzzling to the public, then, to see the increasing use of unnamed sources, which implies some complicity with government. Does it strain credibility to have us barking at the administration like a watchdog outside while licking hands and eating scraps from every stray official inside?

But broaden the definition of fairness even farther. It is very difficult to be fair when you have to squeeze complex reality into too small a space or time. It is a criticism more often made of television than print but not exclusively. Time and space are arbitrarily parcelled out by assumptions about the importance of a story and the degree of public interest. But if the slot is too small, all but the newest facts or opinions get left out—the context, the qualifications, the contrary views, the explanations, extenuations—all the things which tend to make the treatment fair, or seem unfair if they are left out.

By an even wider conception of fairness still, some might argue that it is unfair to the public because such a story gives too simple or lopsided a view of reality.

Well, I am now skating on thinner ice, but I suggest each of these points is a plausible ingredient, if a small one, in the discontent we face.

Tannenbaum/Sygma

Christine Spengler/Sygma

Above, right:
General Westmoreland arrives at the trial to pursue his libel suit against CBS.

Below, right:
American soldiers move through the swamps. Did the CBS documentary intend to add to the nation's knowledge of the Vietnam War or was it the jungle motive to "get" Westmoreland?

But the overall question of fairness is not small, and I will conclude with a far more obvious example.

Of course the reason all this is so much in our minds right now is because the macho arm of American journalism—the commandos of the Fourth Estate, the investigative reporters—have recently been on trial in the most spectacular way.

There has been a lot of media relief that *Time* magazine was only found guilty of an inaccuracy, not libel, and that General Westmoreland withdrew his case against CBS. Clearly that relief is justified in the sense that neither case advanced or encouraged the use of the court system by public officials for punitive revenge on journalists who have attacked their reputations. They may even have served the purpose of clarifying the need for some restraint in damage awards.

That is looking at it from the press point of view—the press anxious to preserve its clear and necessary right to criticize public officials.

But look at it from the public point of view, and take the CBS-Westmoreland case because it was an American official involved and, not irrelevantly, a man many admired for his long and distinguished career of service to this country.

The trial judge and the CBS lawyer said early on to the jury and to the public, the issue is not fairness. And to prove libel it was not. The general had to prove not that CBS was unfair but that it knowingly, maliciously, and recklessly broadcast a false report. And yet outside the confines of the courtroom, for most of the American people. I strongly suspect the issue was fairness.

By its own admission, CBS had not treated General Westmoreland by its own internal standards of fairness. Since the aborted trial, CBS says the documentary* was fair and accurate, but that is not quite what CBS said in the internal investigation conducted by Burton Benjamin.

He said the issue of whether General Westmoreland cooked the books on enemy troop strength in Vietnam for political reasons was "obviously and historically controversial," meaning there were two sides, it was not a proved case, and that there was imbalance in presenting the two sides. General Westmoreland and his one defender got a total of 5 minutes and 59 seconds. Sam Adams, the former CIA official who was his chief accuser, and his eight supporting witnesses got 19 minutes and 19 seconds. Sympathetic witnesses were coddled, one was interviewed twice to improve his testimony, and there were other violations of CBS news standards.

Benjamin also pointed out that the documentary had not included portions of an interview with President Johnson in which he said he was fully aware of the size of the enemy force that confronted the U.S. in the TET offensive—which would have detracted significantly from the impression that he was kept in the dark by Westmoreland.

To its credit, CBS acknowledged the Benjamin report and finally released it in full. The network said it would have been better if the word "conspiracy" had not been used, if more people who disagreed with the premise had been interviewed and if there had been strict compliance with CBS news standards. Those are pretty big "ifs."

If those "ifs" had been followed, the documentary would have been perceived as a fair, objective inquiry, charges made and charges denied, not a trial on television, with CBS in full control of the evidence, playing prosecutor, judge, and jury. Perceived as a fair inquiry, it would have been much harder for General Westmoreland to dismiss as a hatchet job. More to the point, it seems very unlikely there would have been a libel suit at all.

Perhaps CBS' conclusions about General Westmoreland's conduct were completely correct. The net-

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*"The Uncounted Enemy: A Vietnam Deception," one-hour documentary aired by CBS television on January 23, 1982.

The Reagan Administration at first banned the media from Grenada, but some reporters found ways to get there.

[illegible]/Sygma

work says so and late testimony in the trial was clearly pointing in that direction. Perhaps the reality was a good deal more complicated than they made it seem. It was certainly a legitimate if not a very new piece of Vietnam history to subject to this dramatic inquiry. But it can be argued that it was a public service. The war was tragically expensive for the United States, and the judgments good and bad that prosecuted the war deserve the fullest airing.

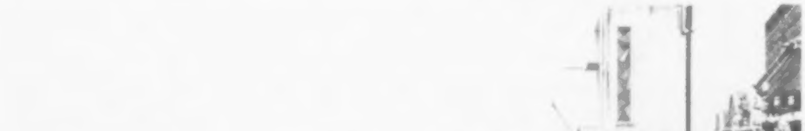
But why is it necessary in a piece of journalism, however right it thought it was, to treat a distinguished American—or anyone else—less fairly than he would be treated in a court of law if charged with a criminal offense?

It makes ordinary people ask, what was the motive? What was the animus? Was it intended to be a serious effort to contribute to the nation's knowledge of the war while some principal characters were still around? Or was it the jungle motive—to get him?

I single CBS out because they are a great news organization and they had the courage to single themselves out in this case by insisting that this hot piece of journalism be tested against CBS traditions and experience. And I suggest that those traditions encompass and assume a sense of fairness that would satisfy most reasonable people.

It is a good example because the frailties of the mighty make us all tremble.

Saigon fell to the North Vietnamese in 1975. MacNeil hopes that "The Uncounted Enemy: A Vietnam Deception" does not become a model for journalism.



Christian Simonpietri/Sygma

I hope "The Uncounted Enemy: A Vietnam Deception" does not become a model for American journalism emulated by others, taught in journalism schools, as what you can get away with.

The First Amendment does not require fairness but I think the American public is beginning to.

In one of the Federalist Papers, Alexander Hamilton asks, "What is the liberty of the press? . . . Its security, whatever fine declarations may be inserted in any constitution respecting it, must altogether depend on public opinion, and on the general spirit of the people and the government." And so the liberty of the American press has depended for two centuries. And I believe that journalistic carelessness or arrogance that ignores basic fairness—a decent respect for the opinions of mankind—will invite attacks on that liberty, and turn the general spirit of the people more hostile.

One survey found majorities of 70 to 80 percent of the American people in favor of laws requiring newspapers and television to give political opponents of major parties and opponents on controversial issues equal coverage. In other words, the public would support laws which are transparently unconstitutional.

Until now, American journalists have ignored or laughed off such views, confident that the right-thinking majority would protect them, and when their enemies had them surrounded, the First Amendment cavalry would gallop up just in time.

Perhaps it always will and perhaps it will not. But if the media want to buy more insurance against public indifference to the First Amendment—fairness is a small price to pay. EP

FINANCIAL REVIEW

EARNINGS PER SHARE DECLINE; QUALITY OF INDUSTRY'S EARNINGS IMPROVES AS CWIP DROPS

Earnings per share for the investor-owned electric utility industry fell 3.4 percent in the second quarter of 1985 from the second quarter of 1984 (see Table 1). The industry earned 65 cents per share on electric operating revenues of $29.1 billion, compared to 67 cents per share during the second quarter of 1984. Twelve-month earnings were $3.12, a 0.5 percent increase from the $3.11 the industry earned for the twelve months ended June 30, 1984. The return on average common equity was 14.5 percent for the twelve-month period, compared to 14.6 percent for the twelve months ended March 31, 1985.

The earnings drop occurred despite a 4 percent increase in electricity operating revenues. Second quarter electric operating revenues increased to $29.1 billion in 1985 from $28.0 billion in 1984. For the twelve months ending June 30, 1985, electric operating revenues were almost $122.7 billion compared to $114.8 billion one year earlier, an increase of 6.9 percent. A 25.5 percent drop in other utility income had a significant effect on the decline in earnings per share. The decline in this category, the majority of which represents income from gas sales by combination companies, reflects the milder than normal temperatures experienced in the second quarter of 1985. Another factor contributing to the decline was a 5.6 percent increase in shares outstanding.

Fuel expense continued its declining trend, decreasing 1.1 percent to $8.9 billion, and fuel as a percentage of total operating revenue fell to 30.4 percent from 32 percent a year ago. For the twelve months ended June 30, 1985, fuel expense increased only 1.7 percent to $37.7 billion. The electric operating ratio (electric operating expenses to electric operating revenues) declined in the second quarter to 81.8 percent in 1985 from 82 percent in 1984.

Despite the decline in earnings per share during the second quarter of 1985, the quality of earnings, as measured by the amount of AFUDC in net income, improved. The allowance for funds used during construction (AFUDC) represents the cost of equity and borrowed funds used to finance construction. AFUDC as a percent of net income available for common declined to 54.5 percent from 58.7 percent one year earlier. During the twelve months ended June 30, 1985, AFUDC accounted for 48.6 percent of net income available for common, down from 50.8 percent one year earlier. AFUDC as a percent of common dividends dropped more than ten percentage points to 67 percent from 77.8 percent. Total AFUDC fell 5.2 percent during the second quarter of 1985, compared to the second quarter of 1984. The decrease in total AFUDC is largely due to the completion of several large construction projects within the past year. Additionally, some companies were not accruing AFUDC on troubled or cancelled plants.

Plant completions in the second quarter of 1985 were also reflected on the industry's balance sheet (see Table 2). Plant in service (net utility plant minus construction work in progress) increased 12.4 percent to $233.8 billion from June 30, 1984, to June 30, 1985. About 40 percent, or $13 billion, of that increase has been added since March 31, 1985. Three large plants were responsible for 71 percent of the second quarter increase. Those same plants also contributed to a 5 percent year-to-year drop in construction work in progress (CWIP). Although the rate of increase in CWIP has been decreasing, this is the first decline in CWIP since year-end 1982, when the annual increase reached a peak of 18.4 percent.

The industry took advantage of lower interest rates to refund nearly half a billion dollars in long-term debt in the second quarter of 1985, according to Ebasco Business Consulting Company's "Analysis of Public Utility Financing." In comparison, the average of total annual refundings for the three years 1982, 1983, and 1984 was $795 million. Refunding activity in the second quarter of 1985 was also up sharply over the second quarter of 1984 when only $7.5 million in long-term debt was sold for refunding. The positive impact of the refunding was reflected somewhat on the income statement. Although long-term debt increased by 6.9 percent, interest expense rose only 5.5 percent to $3.6 billion. Total securities offerings by electric utilities in the second quarter were $3.6 billion, an increase of 50.4 percent compared to the year earlier period, according to Ebasco.

The growth in accumulated retained earnings continued to outperform all other components of the

Table 1

Investor-Owned Electric Utility Industry Statement of Income

(Unaudited)
(Millions of Dollars)

	Three Months Ending June 30,			Twelve Months Ending June 30,		
	1985	1984	% Change	1985	1984	% Change
Total Electric Operating Revenues	$29,142	$27,998	4.1	$122,665	$114,798	6.9
Electric Operating Expenses						
Fuel	$ 8,854	$ 8,948	(1.1)	$ 37,718	$ 37,074	1.7
Other Operation & Maintenance	7,900	7,319	7.9	31,264	27,836	12.3
Depreciation & Amortization	2,508	2,280	10.0	9,723	8,693	11.8
Taxes Other Than Income Taxes	2,133	2,078	2.6	8,718	8,245	5.7
Income Taxes (Federal & Other)	744	564	31.9	4,921	4,057	21.3
Provision for Deferred Income Taxes	1,282	1,235	3.8	4,913	4,956	(0.9)
Investment Tax Credit Adjustment, Net	421	535	(21.3)	1,887	2,022	(6.7)
Total Electric Operating Expenses	$23,842	$22,959	3.8	$ 99,144	$ 92,883	6.7
Electric Operating Income	$ 5,300	$ 5,039	5.2	$ 23,521	$ 21,915	7.3
Other Utility Operating Income	243	326	(25.5)	1,448	1,438	0.7
Total Utility Operating Income	$ 5,543	$ 5,365	3.3	$ 24,969	$ 23,353	6.9
Other Income	$ 617	$ 468	31.8	$ 2,353	$ 1,964	19.8
Allowance for Other Funds Used During Construction	1,243	1,281	(3.0)	5,254	5,165	1.7
Total Income Before Interest Charges	$ 7,403	$ 7,114	4.1	$ 32,576	$ 30,482	6.9
Interest Charges						
Interest on Long-Term Debt	$ 3,554	$ 3,368	5.5	$ 14,310	$ 13,031	9.8
Other Interest Expenses & Charges	246	283	(13.1)	1,127	1,140	(1.1)
Allowance for Borrowed Funds Used During Construction	(745)	(817)	(8.8)	(3,191)	(3,211)	(0.6)
Net Interest Expenses & Charges	$ 3,055	$ 2,834	7.8	$ 12,246	$ 10,960	11.7
Net Income Before Extraordinary Items	$ 4,348	$ 4,280	1.6	$ 20,330	$ 19,522	4.1
Extraordinary Items	(1)	20	n.m.	(55)	(164)	(66.5)
Net Income	$ 4,347	$ 4,300	1.1	$ 20,275	$ 19,358	4.7
Preferred Dividends Declared	701	727	(3.6)	2,900	2,869	1.1
Net Income Available for Common	$ 3,646	$ 3,573	2.0	$ 17,375	$ 16,489	5.4
Common Dividends Declared	2,967	2,695	10.1	11,585	10,698	8.3
Additions to Retained Earnings	$ 679	$ 878	(22.7)	$ 5,790	$ 5,791	—
Avg. Shares Outstanding	5,620	5,320	5.6	5,565	5,307	4.9
Earnings Per Share*	$ 0.65	$ 0.67	(3.4)	$ 3.12	$ 3.11	0.5
Common Dividends Per Share*	$ 0.53	$ 0.51	4.2	$ 2.08	$ 2.02	3.3

*Based on average shares outstanding as reported to EEI by survey respondents and adjusted for stock splits.
NOTE: Revenues are adjusted for intra-industry sales for resale of electricity.

Based on unaudited reports submitted by a sample of electric utilities which account for approximately 94 percent of the industry's revenues from sales to ultimate customers and 93 percent of the industry's total assets.

Table 2
Investor-Owned Electric Utility Industry Balance Sheet
As of June 30, 1985
(Unaudited)
(Millions of Dollars)

Assets	1985	1984	% Change
Utility Plant*			
Utility Plant (Including Nuclear Fuel)	$323,454	$289,791	11.6
Less Accumulated Depreciation	89,630	81,819	9.5
Total	$233,824	$207,972	12.4
Construction Work in Progress	96,229	101,282	−5.0
Net Utility Plant	$330,053	$309,254	6.7
Investments	7,974	7,209	10.6
Current Assets	35,642	33,700	5.8
Deferred Debits	18,976	13,523	40.3
Total Assets	$392,645	$363,686	8.0
Capitalization & Liabilities			
Capitalization			
Common Stock	$ 82,563	$ 76,732	7.6
Retained Earnings	43,668	38,121	14.6
Preferred Stock	31,880	31,823	0.2
Long-Term Debt	146,313	136,930	6.9
Total Capitalization	$304,424	$283,606	7.3
Current Liabilities			
Short-Term Debt	$ 6,212	$ 6,126	1.4
Long-Term Debt Due Currently	3,811	3,878	−1.7
Other Current Liabilities	26,055	25,105	3.8
Total Current Liabilities	$ 36,078	$ 35,109	2.8
Deferred Credits			
Accumulated Deferred Income Taxes	$ 30,106	$ 24,985	20.5
Accumulated Deferred Investment Tax Credits	14,858	13,223	12.4
Other Deferred Credits	7,179	6,763	6.2
Total Deferred Credits	$ 52,143	$ 44,971	15.9
Total Capitalization & Liabilities	$392,645	$363,686	8.0

*Includes other utility plant of combination gas and electric companies.

*Based on average shares outstanding as reported to EEI by survey respondents and adjusted for stock splits.
NOTE: Revenues are adjusted for intra-industry sales for resale of electricity.

Based on unaudited reports submitted by a sample of electric utilities which account for approximately 94 percent of the industry's revenues from sales to ultimate customers and 93 percent of the industry's total assets.

industry's capital structure. This favorable trend, which began in the third quarter of 1983, is increasing the financial flexibility of the electric utility industry. On June 30, 1985, accumulated retained earnings totalled $43.668 billion, up 14.6 percent from one year earlier.

Preferred stock, which increased less than 1 percent to $31.9 billion, dropped to 10.5 percent of total capitalization from 11.2 percent. Long-term debt increased 6.9 percent to $146 billion, but declined slightly to 48.1 percent of total capitalization from 48.3 percent one year ago. Total common stock equity increased to 41.5 percent of total capitalization from 40.5 percent. Common stock grew 7.6 percent to $82.6 billion.

Although pre-tax interest coverage (including AFUDC) slipped to 2.79 times for the quarter, compared to 2.81 times a year earlier, interest coverage for the twelve-month period was 3.08 times, unchanged from the period ending March 31, 1985. Despite the slight quarterly declines in earnings and interest coverage, bond ratings of the electric utilities continue to reflect the improving financial condition of the industry. Through the second quarter of 1985, one rating agency increased its ratings on the senior debt securities of 18 electric utilities, while lowering the ratings of seven others. During the second quarter alone, electrics were upgraded 13 times and downgraded only twice. EP

Contributed by the Finance and Regulation Department of Edison Electric Institute.

REGULATORY REVIEW

EEI RESPONDS ON GENERIC RATE OF RETURN

Responding to the Federal Energy Regulatory Commission's (FERC) rulemaking on generic determination of rate of return for public utilities, Edison Electric Institute (EEI) filed comments on August 30, 1985, arguing for refinements to procedures FERC has proposed to date, procedures involving discounted cash flow models, estimates of dividend growth and stock flotation costs, quarterly indexing, and the generic treatment of jurisdictional risk.

FERC instituted the proceeding, its second annual, to establish an average cost of common equity for jurisdictional operation of electric utilities. The arrived-at figure will be an advisory guide for rate case parties and a reference point for the commission.

Generic procedures for setting benchmark rates of return on equity (ROE) were first reached in July 1984, with a provision for annual redeterminations and a method for quarterly updates between proceedings. Following the third annual proceeding, the benchmark ROE will stand as a "rebuttable presumption," and the burden of proof will rest on contradictors.

"[W]e basically agree with a substantial portion of the commission's efforts," said EEI. Among other things, however, "we believe there may be a misunderstanding about the use of a discounted cash flow [DCF] model in computing the benchmark K" (annual market-required return on capital), EEI said.

FERC has chosen the continuous compounding DCF model, "which does not provide an accurate expression of the cash flows investors expect," EEI said. The chosen model understates looked-for cash flows because it uses current dividend yield rather than expected yield, EEI pointed out.

The commission had earlier noted that the most difficult part of a DCF derivation comes in estimating the growth factor, according to EEI, and in this proceeding FERC has decided to rely in its calculations on "a fundamental analysis of how growth occurs in dividends." But such a method "involves too many subjective decisions," EEI said.

A far more accurate and reliable growth estimate can be drawn from financial analysts' consensus growth rate forecasts (specifically Institutional Brokers Estimate System, I/B/E/S), according to EEI, which in any case are the projections used by investors when they make investment decisions.

The rate of return calculated using DCF is a "bare bones" return, EEI said, to which must be added flotation costs, the real costs of producing a market return sufficient to compensate for stock issuance costs. FERC adopted a method which adjusts for direct issuance costs but not for "market pressure" and "market break," which account for declines in stock price in the wake of company announcements of new issues and other fluctuations at the time of issuance, said EEI.

Such costs are important components of overall flotation cost, according to EEI, and "to exclude flotation costs or to apply them to only a portion of equity would be unfair to investors whose capital has made the supply of electric service possible. It would also discourage future investors, making it more difficult for utilities to attract capital on reasonable terms."

Calculating a 10.95 percent expected electric dividend yield, a 4.48 percent growth rate component, and an issuance cost of 2.48 percent (of stock value), EEI recommended that the commission adopt 15.71 percent as the benchmark ROE for the "base year" ending June 30, 1985.

EEI acknowledged some member company support for full redetermination of benchmark ROE each quarter, although EEI itself continues to endorse a quarterly update procedure between annual redeterminations.

Finally, EEI analyzed the possible difference in company risks associated with wholesale (that is, FERC jurisdictional) as opposed to retail operations and whether such a differential affects company cost of equity. On a number of grounds, EEI urged the commission to reject attempts to identify a generic risk differential. "Any assertions regarding the unique risk characteristics of a particular company . . . should properly be presented in case-specific proceedings," EEI said.

First of all, said EEI, relative degrees of risk among wholesale and retail portions vary so much between companies and between jurisdictions that simple generalization is controversial and quantification is almost impossible. Moreover, investors assess a company's riskiness in terms of its aggregate market effect; even comparison of business segments within a company within a defined period are purely subjective, EEI said.

Questions concerning FERC's generic determination of rate of return on common equity for public utilities may be directed to EEI senior financial analyst Kristen Martinez at (202) 828-0807.

EEI's comments, submitted August 30, 1985 (46 pages, 2480), and FERC's Notice of Proposed Rulemaking (NOPR) instituting the second annual proceeding, issued July 19, 1985, at Docket No. RM85-19-000 (16 pages), are both available to EEI members. EP

Contributed by the Finance Department of Edison Electric Institute.

STATISTICAL REVIEW

SALES OF ELECTRICITY INCREASE 2.0 PERCENT

Sales of electricity reported by the investor-owned electric utility industry for the second quarter of 1985 were 2.7 percent greater than in the second quarter of 1984 (see Table 1). As in recent quarters, marginal gains in the economy-sensitive industrial sector and weather-sensitive residential sector held down the rate of increase. In all, the industry sold 422,430 gigawatt-hours (GWh) in the second quarter of 1985, 11,189 GWh more than in the second quarter of 1984. On an annual basis, sales were up 2.0 percent for the year ending June 30, 1985, somewhat below the increase forecast for the year. Customer growth in the second quarter showed moderate gains, increasing 1.9 percent over the second quarter of 1984.

The small increase in GWh sales of electricity to ultimate customers, for the quarter and the year ending June 30, 1985, is indicative of the slowing economic recovery. Sales to industrial customers increased only 0.7 percent in the second quarter of 1985, while sales to residential customers, during a quarter which was relatively warmer than the comparable quarter of 1984,

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Table 1
Customer, Sales, and Revenue Data: Investor-Owned Electric Utilities

	Quarter Ending June 30,			Year-To-Date		
	1985	1984	% increase	1985	1984	% Increase
Number of Average Customers						
Residential	67,360,563	66,173,728	1.8	67,131,432	66,087,344	1.6
Commercial	8,218,128	7,977,083	3.0	8,158,218	7,943,426	2.7
Industrial	364,562	394,576	-7.6	380,462	391,094	−2.7
Street & Highway	120,258	111,687	7.7	117,854	111,520	5.7
Other Public Auth	141,991	138,540	2.5	143,224	137,910	3.9
Railroads	23	23	0.0	23	24	−4.2
Interdepartmental	487	469	3.8	478	476	0.4
Total Customers	76,206,012	74,796,106	1.9	75,931,692	74,671,794	1.7
Electricity Sales (MWh)						
Residential	124,496,041	123,524,077	0.8	282,031,145	279,390,304	0.9
Commercial	119,276,728	111,754,748	6.7	238,305,804	226,647,583	5.1
Industrial	163,441,161	162,375,730	0.7	318,887,820	318,100,021	0.2
Street & Highway	2,383,122	2,320,844	2.7	5,099,527	5,029,724	1.4
Other Public Auth	11,516,071	9,977,676	15.4	22,111,805	20,254,425	9.2
Railroads	533,266	485,378	9.9	1,127,063	1,027,750	9.7
Interdepartmental	783,611	802,815	−2.4	1,497,639	1,545,147	−3.1
Total Sales	422,430,000	411,241,268	2.7	869,060,803	851,994,954	2.0
Revenues ($000)						
Residential	9,880,622	9,404,043	5.1	21,394,368	20,777,477	3.0
Commercial	9,006,764	8,203,148	9.8	17,662,017	16,526,977	6.9
Industrial	8,442,497	8,137,038	3.8	16,471,072	15,630,354	5.4
Street & Highway	284,032	265,930	6.8	574,997	539,100	6.7
Other Public Auth	573,032	522,209	9.7	1,126,438	1,026,108	9.8
Railroads	35,828	33,860	5.8	76,091	67,454	12.8
Interdepartmental	41,844	28,716	45.7	80,752	54,643	47.8
Total Revenues	28,264,619	26,594,944	6.3	57,385,735	54,622,112	5.1

grew at only 0.8 percent. Sales to commercial customers grew at a more traditional rate of 6.7 percent in the second quarter of 1985.

For the year-to-date period ending June 30, 1985, sales to ultimate customers increased 2.0 percent to 869,061 GWh from the 851,995 GWh recorded for the same period during 1984. Softness in sales in both the industrial and the residential sectors has suppressed growth for the first half of 1985. In addition, the near record sales growth recorded during 1984 occurred during an upswing in the business cycle and unusual weather conditions, neither of which has been a key factor in this year's demand. EP

Contributed by the Statistics Department of Edison Electric Institute.

BOOK REVIEW

THE POWER MAKERS

Richard Munson
Rodale Press, 1985
Emmaus, Pennsylvania, 320 pp.

Reviewed by Hal Dunham

The electric utility industry is changing.

How true! Richard Munson's thesis is that expanding cogeneration and the advent of "alternative" energy technologies are promoting change. That, too, is true.

Munson, former director of the Solar Lobby, believes this will result in increased competition for electric utilities. Again, there is no dispute. Much has been written about it in the trade press, and one of Edison Electric Institute's goals is to "assist the industry in adapting to new forms of competition and regulation."

Perhaps all the evidence of technological, organizational, and regulatory change in the electric utility business needed to be congealed somewhere to get public attention. If so, *The Power Makers* does serve a purpose.

A vital industry is in the throes of dramatic change with significant implications for the public, but the book makes no recommendations for the course of future policies. It seems to gloat over the fact that big business will have to confront change when the author ought to be grappling with difficult questions about national policy.

Is the nation's policy still to assure adequate power at reasonable rates? If not, what should replace it?

How can the nation avoid in electricity service the deterioration that has affected the telephone industry in its closely parallel situation?

Is the public utility concept still valid? What of the principles of reasonable cost, non-discrimination, and obligation to serve?

Munson is silent. Because he is, the book is destined neither to help nor hurt in the long run, although it may cause some temporary discomfort for those whose names are mentioned.

The volume is more of a capsulized history of the industry from the author's sometimes jaded viewpoint, that being, as the dust cover says, "the inside story of America's biggest business and its struggle to control tomorrow's electricity."

For example, Munson provides a discussion about "cream skimming," deregulation, diversification, and other subjects without conclusion or recommendation. He prefers instead the more attention-getting stance of making predictions about "rate shock" when nuclear plants come on stream and of repeating the X-year-old advice of Wall Street brokers to beware of utilities with big construction programs. The book contains a listing of cogeneration firms and some dealing in alternative technologies, but, of course, admonishes: "Be sure to thoroughly investigate the individual companies before you participate" (buy stock).

Electric utility executives with thick skins might glide through this book and even on occasion find something familiar in the history of the industry. Munson has some utility heroes, but others will chafe when they read lines such as, "Utility critics suggest that the only way power companies can survive is if 'old guard' executives, who were recruited from the bottom third of their engineering class and are protected from competition by regulatory bureaucracies, are given pink slips and sent into retirement."

That's one of the problems of this book. That sort of remark is uncalled for and diverts the author from what might have been a constructive contribution to understanding change and to attempting to chart a course for the future. Instead of heeding his own perception of the forces of change, he mires himself in anti-big business arguments that belong to a past age.

He tars others with a similar brush—regulators are lackeys of the industry; public power, environmentalists, and consumerists are not without fault. And that Edison Electric Institute convention he attended reeked of cigar smoke (although in the next breath he finds fault with it being air conditioned).

In a strategic sense, perhaps the most significant thing about this book is its use of a writing technique that seems to pervade so-called "investigative reporting." It is the device of "charge, discharge, recharge." With recharge, all defenses against the original charge are dismissed, no matter how valid, and the author returns to his original contention.

For example, electric companies are raked over the coals for having eliminated competition, having "formed state regulatory commissions," and having created monopolistic empires. Discharge (a pretense at objectivity) then comes with an admission that large companies are needed because of their financing and engineering skills and abilities. But (recharge) power trusts failed to bring power to hard-working farm wives, and the reader is brought back to the supposed evils of utilities.

One wonders how regulatory commissioners will react to the same techniques when used against them. First (charge), they're lackeys of the utilities, then (discharge) get a pat on the back for holding down rates, then (recharge) are attacked for opposing deregulation and therefore are lackeys of the entrenched utilities. In fact, regulators probably will wonder whatever happened to some hundreds of years of English common law from this highly selective history of regulation, let alone whatever happened to the precedent-establishing New York State regulation of utilities.

Utilities "gobble" and are "swaddled in benefits." "Whoops" is made to sound like an investor-owned company. Niagara's great technological contributions are overlooked. AFUDC (Allowance for Funds Used During Construction) is criticized, but there is no support of CWIP (Construction Work In Progress). The "economies of scale" go without mention, except for use of the phrase, which may be at the foundation of his belief in decentralization and small power sources.

Utilities are criticized for minuscule research programs, but huge expensive efforts to develop fluidized bed combustion and coal gasification, in the author's view, are "alternative energies." Utility profits, in his mind, are "guaranteed," but then some companies are near bankruptcy. Economic dispatch of power is regarded as new and, in the author's mind, revolutionary.

Of course, to remain objective, the author (discharge) admits utilities do argue legitimately for reliability and safety, and he admits "instilling competition in the electric industry does not guarantee Utopia. In fact several problems will arise."

But then (recharge), "many utility executives will certainly exercise their substantial political muscle to oppose independent power suppliers."

So there he goes again. The reader is left without a recommendation as to where the nation's policies should be pointed to assure a smooth transition toward the new era of electricity service. Too bad. Those looking for constructive policy guidance and suggestions will have to look elsewhere. EP

Hal Dunham is Director of Special Projects and Member Company Services at Edison Electric Institute.

TECHNOLOGY REVIEW

EPRI OFFERS HIGH-VOLTAGE TEST FACILITY AS PROBLEM-SOLVING LAB

At a formal dedication ceremony held in Massachusetts this past September, representatives of 40 different utilities witnessed the transfer of ownership of the High-Voltage Transmission Research Facility (HVTRF) from the General Electric Company (GE) to the Electric Power Research Institute (EPRI). Located in Lenox, Massachusetts, the HVTRF, formerly known as Project UHV and currently the largest research center dedicated to the study of high-voltage AC and DC lines, was a gift from GE to EPRI. GE's Electric Utility Systems Engineering Department will continue to manage the facility for the Institute.

At the dedication, Richard Kennon, EPRI program manager for overhead transmission lines, explained that a new research emphasis at the facility will provide EPRI member utilities with a place for solving problems in the building or upgrading of transmission lines and for resolving questions associated with the licensing of new lines. The Institute hopes, Kennon explained, that member utilities will use this facility as an extension of their own laboratories and staff.

Built by GE in 1958, the facility was first used to study extra-high voltage and to assist in the development of transmission equipment in the 345- to 765-kilovolt (KV) range. In recent years, research at the facility has included the study

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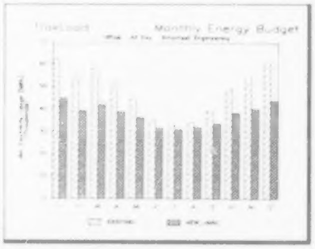

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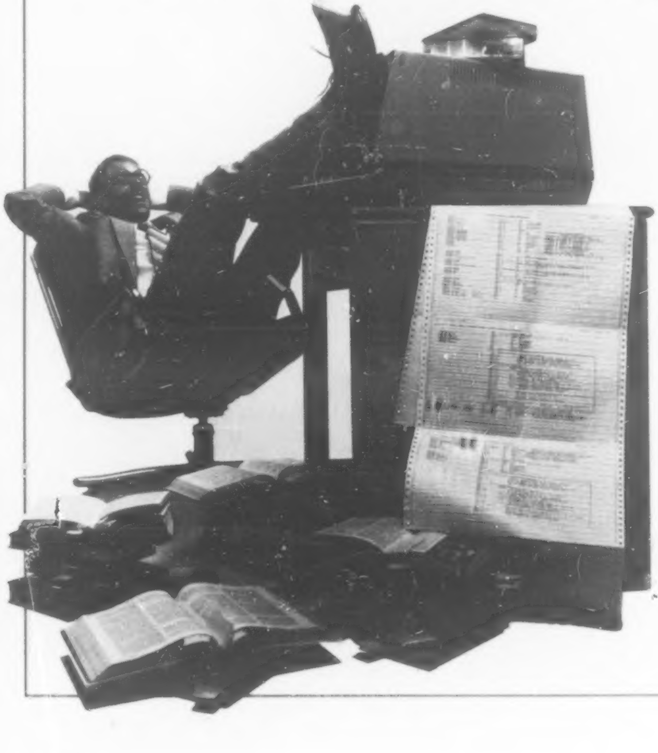

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of voltage ranges from 500 to 1,500 KV. EPRI's own research at the HVTRF in the past three years has concentrated on HVDC transmission lines, and this long-range HVDC research will continue at the facility, but it will now play a secondary role as the HVTRF concentrates on helping EPRI members solve their near-term transmission line problems.

The facility is uniquely qualified to carry out this research as it houses two full-scale lines that can duplicate actual operating lines to test for voltage, conductor geometry, phase spacing, and conductor height. A proposed line can be tested to meet performance parameters for 3-phase AC transmission up to 1500 KV and for DC transmission to ± 1500 KV. Other useful applications include qualifying lines for environmental acceptability, including the study of electric and magnetic fields; testing various types of insulators for performance characteristics; and checking switching surge performance of tower designs.

The U.S. Department of Energy (DOE) is also using the HVTRF to study the decay of electrical fields and charged-particle density near HVDC lines. The intent of the federal research is to assess the effects of HVDC lines on their immediate surroundings by measuring the electrical charges on dust particles beyond transmission rights-of-way. The DOE research will continue under EPRI ownership of the facility.

The location of the HVTRF in the Berkshire Mountains makes it a perfect testing ground for transmission lines research because of the diverse weather conditions. The area produces rain, snow, fog, and extreme temperatures, yet the surrounding hills also help to shelter the lines from high winds and the resulting vibrations. Also used for testing weather effects at the site is a ten-sided fog chamber designed to check the flashover voltage of contaminated insulators for both

Electric Power Research Institute

1500-kilovolt SF_6 gas capacitor voltage divider is used to make measurements on high-voltage transmission systems under study at the High-Voltage Transmission Research Facility.

AC and DC lines. Strings of insulators of different shapes and materials are examined under constant fog conditions.

The HVTRF also maintains a sophisticated computer monitoring system to assist in the continuous acquisition of all-weather data, a necessity for transmission line research. Other instrumentation systems monitor test line performance under other types of conditions. The facility maintains a historical file of computer data, and utilities can search the file to gain research information that can help avoid duplication of effort.

The HVTRF staff, which includes experts in transmission line research and electrical testing capabilities, assisted in the publication of the first edition of EPRI's "Red Book," or *Transmission Line Reference Book—345 KV and Above*, which has become the industry standard on the electrical design of high-voltage AC lines. The preparation of a similar reference book on high-voltage DC transmission, updating an earlier 1977 edition, is now underway by the facility staff and is expected to be completed in 1986.

The HVTRF will be available to all utilities on a first-come, first-serve basis. Utilities belonging to EPRI will pay only out-of-pocket expenses, whereas a fee will be charged to non-members.

For further information on the HVTRF, contact Luciano Zaffanella, manager of the HVTRF, (413) 494-4356, or Richard Kennon, EPRI Overhead Transmission Lines Program Manager, (415) 855-2311. ≡P

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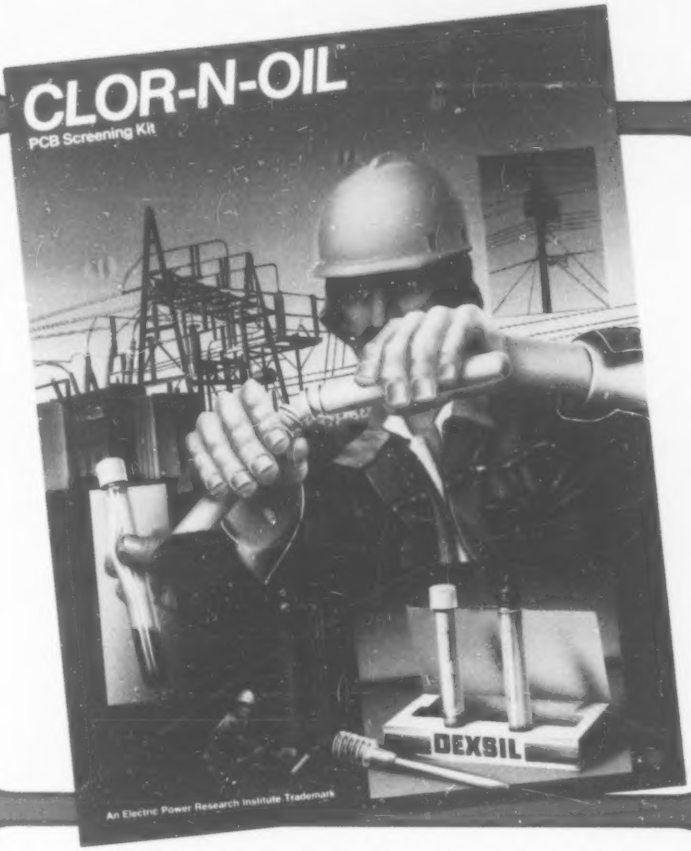

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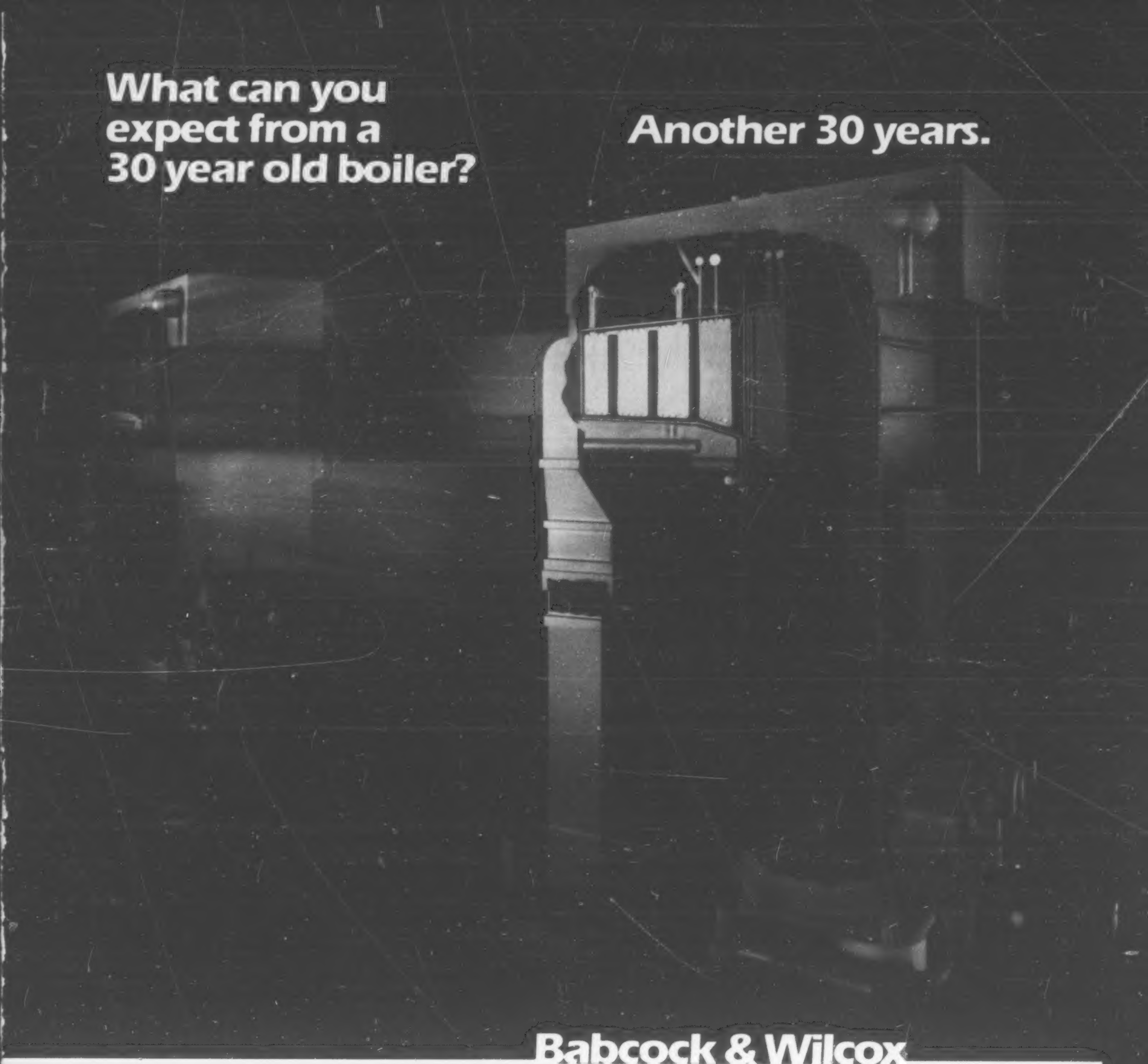

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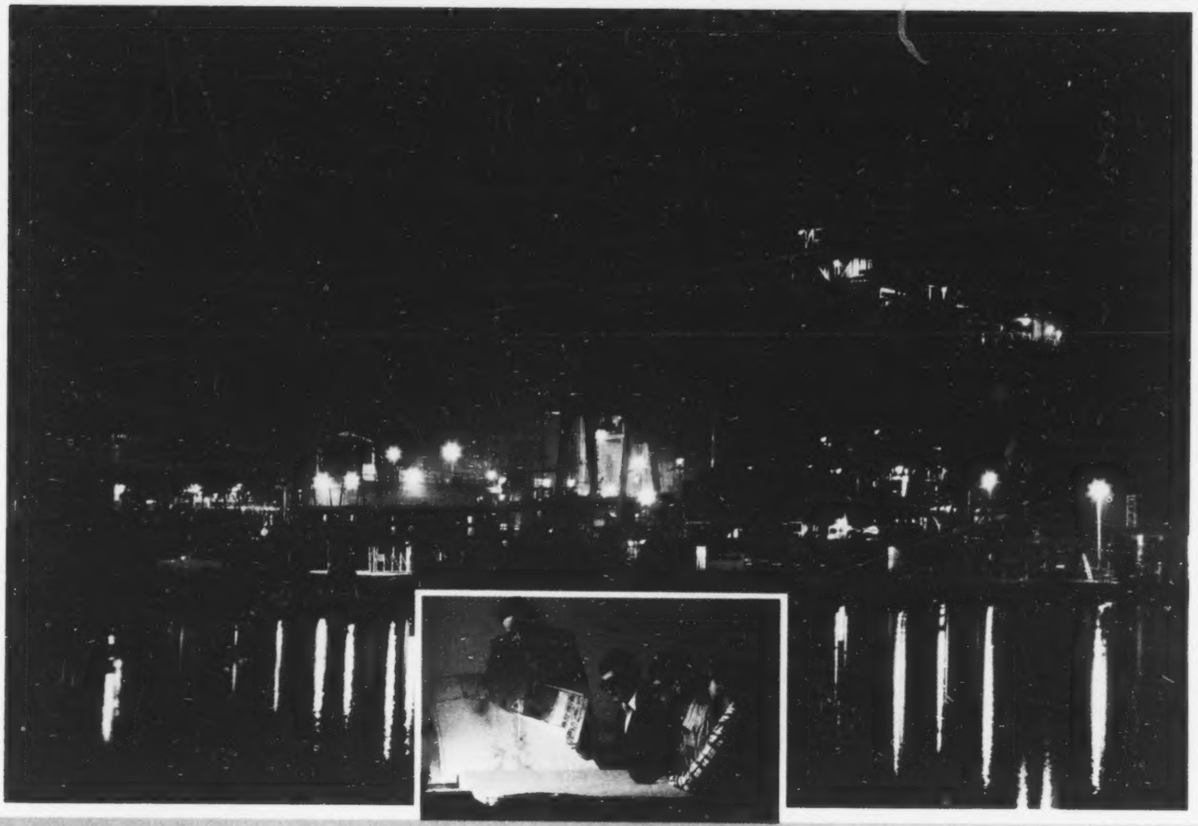

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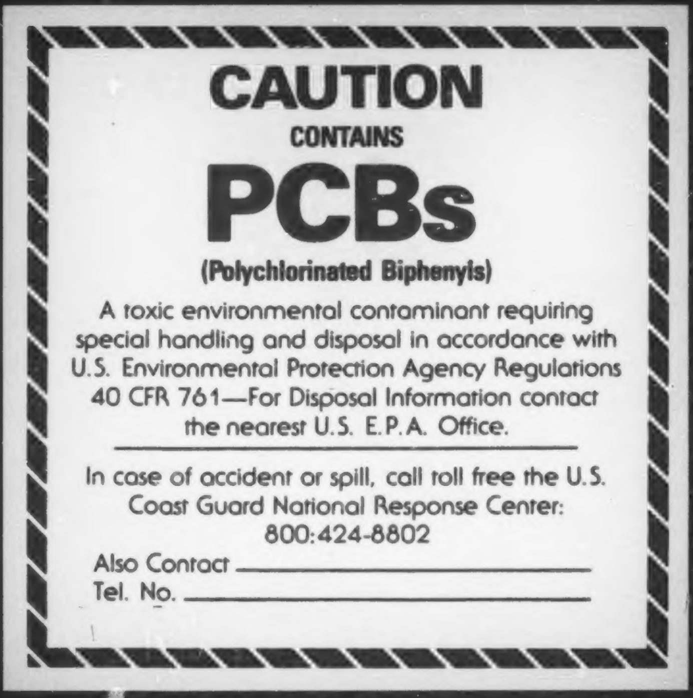

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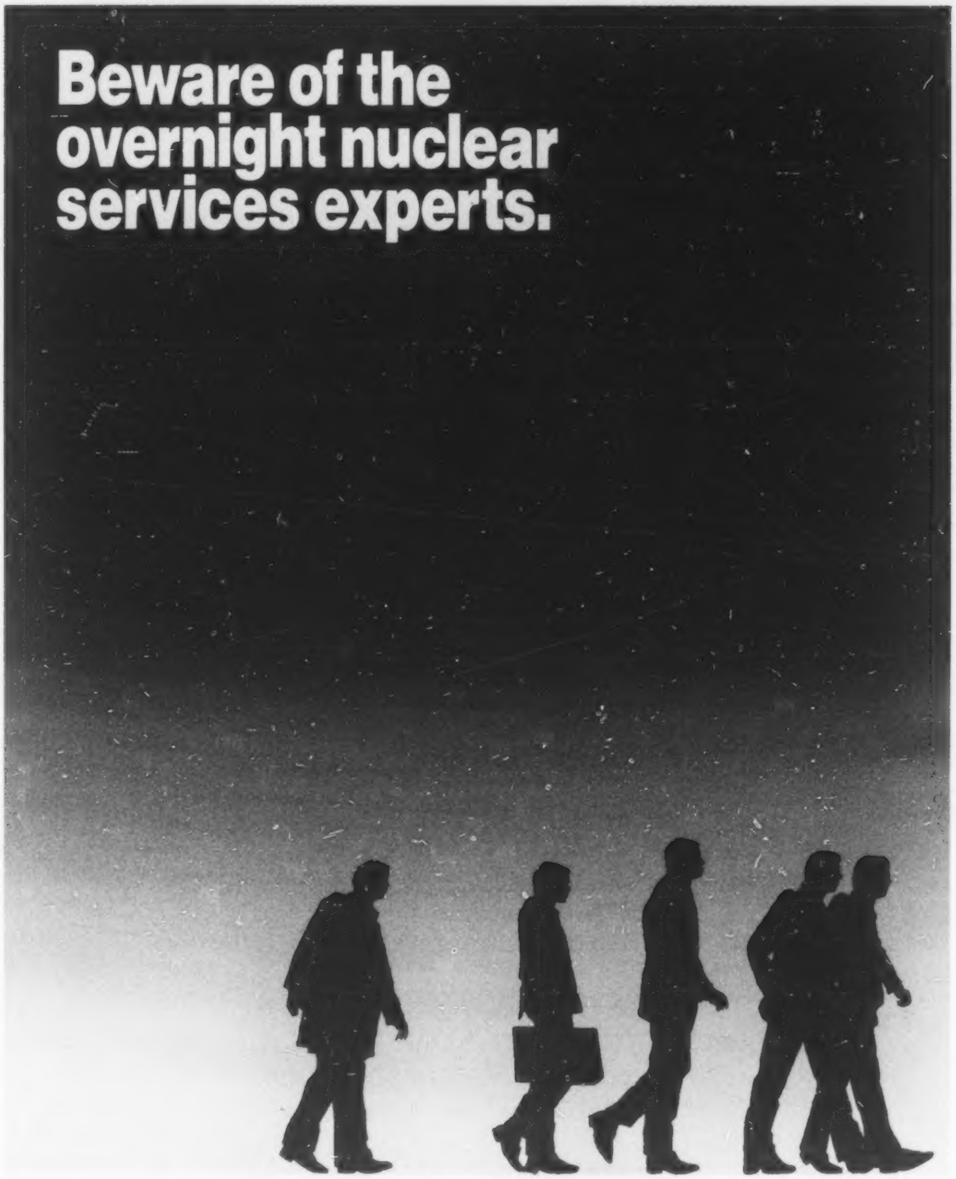
Beware of the overnight nuclear services experts.

The increased influx of nuclear service know-it-alls is alarming.

Some represent big corporations who have recently started, or taken over, small nuclear service companies. Others come from two or three man shops who have simply climbed on the nuclear services bandwagon. They all talk big and bid low.

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A PERIODIC REPORT FROM BURNS AND ROE

SPRING, 1986

Burns and Roe marks 10th anniversary of providing power plant "road maps"

If you were driving in an unfamiliar part of the country, what is the one thing you would most like to have?

An up-to-date road map, of course. It gives you the information you need – route numbers, intersections, cities and towns, and key landmarks such as bridges and tunnels – to help you get where you are going.

Exactly 10 years ago, Burns and Roe realized that power plant operating personnel needed a variation of a road map to help them understand and know exactly what they had to operate within the plant. While the flow diagrams, piping and instrumentation diagrams, instrument loop and logic diagrams and electrical elementaries explain how the plant was designed, they do not allow the operator to see and understand each system within the plant. Because they are engineering documents, they contain vast amounts of information – some of it occasionally outdated – that is extraneous to the operator.

What Burns and Roe developed back in 1976 was the Operational Schematic, a graphic representation of a power plant system compiled and arranged on a single document to depict the operational characteristics of the system. Major flow paths and equipment are highlighted and color coded in an easy-to-follow format that gives the operator a quick but thorough understanding of exactly what the system consists of and how it functions.

Over the past 10 years, Burns and Roe has produced Operational Schematics covering a total of 600 systems in 10 fossil-fired plants and 4 nuclear plants. Bruce Studley, Manager of Plant Test and Operations for Burns and Roe, explains what each schematic contains:

- **Every appropriate system component**
- **The process arrangement, including piping and all valve types**
- **Control room operator display devices**
- **All instrumentation**
- **Interfacing systems**
- **Power supplies**
- **Control logics associated with automatic actions of various system equipment**
- **Setpoints for all control valves, alarms, relief valves, and logics**
- **Computer point addresses**
- **Baseline operating data values**

An Operational Schematic can be used either in the control room or out in the plant, and, of course, is an invaluable training aid. The schematics can be provided in a variety of formats, including a reduced size which fits easily in the operator's pocket.

What do Operational Schematics cost? They can range from $4,000 for a relatively simple system to $10,000 for a highly complex system.

Mike Rodin, Supervisor of Configuration Control and Reliability Engineering of Southern California Edison's San Onofre Nuclear Units 1, 2, and 3, says the schematics are well worth the investment. "The reaction of operating personnel has been positive," he reports, "and we are getting requests for them from others on site. The Training Department has laminated them for training purposes. When we are finished, we will have schematics on more than 90 systems."

Bruce Studley

Paul Jones, Operations Superintendent of the D.B. Wilson Unit 1 of Big Rivers Electrical Corporation, has had schematics prepared for more than 60 systems. He says that the reaction of operating personnel to the schematics is very favorable, and that the original set in the control room wore out because it was used so often. Their biggest asset, he adds, is that "They are a place to go to see *how* things are expected to operate. They keep everyone pointed in the same direction."

Other utilities which have had Operational Schematics prepared by Burns and Roe include Central Maine Power Company, South Carolina Service Authority, Cajun Electric Cooperative, and Seminole Electric Cooperative.

Studley, who received his B.S. degree in mechanical engineering from Northeastern University in 1971 and joined Burns and Roe in 1977, adds that it does not matter whether Burns and Roe was the original engineer and designer of the plant.

Studley points out that Operational Schematics provide the following direct benefits by displaying in one document all the information required by plant personnel to properly and safely operate equipment and systems:

- **Plant specific**
- **Clear and concise**
- **Operator reference document**
- **Quick access for all personnel**
- **Training aid**
- **Easy to modify and update through CADD**

These direct benefits lead to improved availability. "With so many utilities looking for ways to extend plant life," concludes Studley, "Operational Schematics can be one effective, and relatively inexpensive, way to achieve the goal."

Burns and Roe offers wide range of nuclear plant services

Over the past seven years, Burns and Roe's Nuclear Plant Services Division (NPSD) has provided a wide variety of support services to 44 nuclear power plants operated by 25 different utilities, including GPU Nuclear, Arizona Public Service, Nebraska Public Power District, Illinois Power Company, Tennessee Valley Authority, and Pacific Gas & Electric.

A brief review of some current NPSD projects for GPU Nuclear offers a sampling of NPSD's diverse capabilities:

- At GPU's Oyster Creek plant (Forked River, NJ), Burns and Roe is working on Appendix R modifications which are scheduled for completion by the end of the refueling outage planned for this year;
- Also at Oyster Creek, Burns and Roe is furnishing engineering and design services for the installation of a new rod worth minimizer system, including interfaces with other plant systems;
- At Three Mile Island 1 (near Harrisburg, PA), engineering and design services are being provided for a fuel-handling area ESF ventilation system, which will be installed before the next fueling outage;
- Also at TMI 1, Burns and Roe is furnishing engineering and design services for the addition of a new plant computer multiplexer system which will be installed during the refueling outage;
- At TMI 2, engineering support and drawing update services are being furnished in support of recovery and defueling activities.

Since 1980, Burns and Roe has performed more than 200 tasks for GPU Nuclear, involving as many as 70 engineers and designers during peak periods.

New non-power projects

Although Burns and Roe originally built its reputation with its achievements in power plant engineering and construction, the company has diversified over the past decade to the point where it is a full-service engineer/constructor. Following is a sampling of some of Burns and Roe's current non-power projects.

Ogden Martin Systems of Hillsborough: engineering, design and procurement services for a 1,200 tons/day solid waste energy recovery facility in Florida. **Western Union/Merrill Lynch/Port Authority of NY & NJ:** design and construction management of Teleport, world's largest satellite communications facility. **U.S. Army Corps of Engineers:** design assessment and equipment procurement and installations in connection with a new facility in Pine Bluff, AR, to incinerate materials containing a chemical warfare agent. **McDonnell Douglas Astronautics Co.:** design and construction surveillance of an office/lab facility. **Ferro Corp.:** major modifications and additions to manufacturing facilities in Los Angeles, CA.

The Obligation to Serve

Can commissions and customers expect—their electric utility to provide adequate and reliable service no matter what?

In the past several years and with increasing frequency, proposals have been advanced in professional journals and in public policy forums suggesting significant (often radical) changes in the structure and method of regulation of the present day electric utility industry.

By itself, the drumbeat call for reform is not unique to these times. From the very beginning of electric utility service, questions concerning the industry's performance, organization, and ownership have provoked debate and controversy. What differentiates today's discussion from those of the past, however, is the apparent growing consensus that the current system of regulation is not producing optimal (or even acceptable) results for either the industry participants and their shareholders or the public they serve. From such common ground are grown the seeds of significant structural change.

At the core of the proposals put forward in recent years is a certain free-market faith that competition, in substitution for regulation or in combination with regulation, can better achieve the social objectives of resource efficiency, consumer protection, and least-cost power supply. But the competition spoken of in these proposals is not the franchise competition that dominated the public and private power debate of the early part of this century. Present day proponents of competition contemplate instead an increased competitiveness in bulk power markets to be brought about by a combination of eased market entry to non-utility suppliers, a relaxation of the regulatory discipline of wholesale rates, and increased availability of intermediary transmission to effect power sales over larger geographic areas and across political borders.

The literature accompanying these proposals gives detailed consideration to how best to bring about these changes, whether by incentive, compulsory process or a combination of the two.[1] Elaborate discussion can be found concerning the merits or problems one might expect to encounter under the various proposals for industry disintegration or dismemberment (to be achieved through the functional separation of generation from transmission and distribution). Academics have filled the texts with talk of natural monopoly characteristics and resource allocation efficiencies. But there is surprisingly little direct consideration given to the time-honored utility obligation to provide adequate and reliable service and how the various proposals might affect the discharge of that duty in increasingly competitive and uncertain markets.[2]

Nature of the Duty to Serve

The utility's duty to serve is a legally imposed and defined obligation[3] that finds its roots in the common law. Generally speaking, it is an obligation that "comes with the territory" and is imposed on entities that have accepted franchises or otherwise held themselves out or "professed" to offer essential services to the public. Commonly expressed, the imposed duty is to provide reasonable service to all applicants on non-discriminatory terms.

Today, almost all states have given statutory expression to this duty, supplanting the common law principles. Thus, while the common law may give useful interpretive guidance, it is necessary to consult the codes of each of the individual states to gain a precise understanding of the obligations an individual utility may be bound to observe. And these individual state expressions of the utility's "duties" can and do differ in important respects.

What one finds upon inspection, however, is that these statutes, despite their differences, are heavily laced with standards of reasonableness, and, even where the statute is expressed in more absolute terms, the courts have implied a reasonableness test in construing the obligation. As a general rule, therefore, only "reasonably adequate" service must be provided.

Over the years, the courts, regulatory commissions, and regulated utilities have worked out pretty well-developed understandings as to what constitutes reasonably adequate service when it comes to additions, extensions, repairs, improvements or additional services. There is scant guidance, however, on what obligation an electric utility may have to invest in additions to capacity to assure adequacy of service.

The guidance is scant because the question has generally not arisen in the context of the adequacy of electric power supply;

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Lee Moore/Uniphoto

those few cases in which the courts have addressed related issues are tied to unique or special circumstances that do not provide useful lessons for broader application.[4] Nor do the supply deficiency cases having to do with natural gas, where investment in additions to supply is subject to considerable geologic uncertainty, teach us much about how the duty to serve might be applied to electric utilities in the event of power supply deficiencies. Electricity is not gas. There are fundamental differences between the two services, which make the drawing by analogy from the experiences or policies governing the one to apply to the other an exercise that sometimes may "sound" sensible but often is not.

The history of electric utility regulation is one in which regulatory tensions have been concerned with overcapacity, not undersupply. Indeed, at the present time these tensions are at their apex as state regulatory agendas have become crowded with "prudence" challenges to past investments in capacity that is in excess of present day requirements or more costly than available alternative supplies of power or conservation substitutes. In 1984, reserve margins for the nation as a whole were almost 34 percent, an historic high and a figure unimagined ten years ago. It will take some time to work this margin down or spread it around; and there is still a fair amount of construction underway. So it may seem somewhat premature, perhaps, to ponder how a future regulatory commission or court might enforce an obligation to serve on an electric utility that refuses or has failed to invest in capacity.[5] Yet this question would seem to have present day relevance for those utility managers who have determined to eschew investment in conventional central station generation in favor of alternative, less capital-intensive strategies for meeting future requirements—especially if these managers wish assurance that their regulatory commissions will not apply adverse hindsight judgments to their current strategic plans.

Hedging with Low-Growth Planning Strategies

In recent testimony before the United States Senate, Sherwood H. Smith, Jr., speaking as chairman of the Edison Electric Institute, announced that investor-owned utilities have largely shifted to a low-growth planning strategy that defers any additional investment in new central station capacity in favor of (1) new generating technologies that are smaller, modular, and environmentally cleaner; (2) demand-side management programs; and (3) greater reliance on third-party power supplies made available through strengthened transmission systems.[6] This strategy is essentially a hedge designed to buy some peace in the regulatory arena and wring out the benefits of short-term overcapacity unevenly distributed throughout the industry.

In adopting this course of action, Smith informed the Senate that the industry "*hope*[s], and now *expect*[s], that these strategies plus the level of planned additions *may be enough* to satisfy our basic needs until sometime in the early to mid-1990s" [emphasis added]. These are hardly words of great comfort to those searching for confidence that utility service ten years hence will be reliable and adequate to satisfy future requirements. But who can contest the reasonableness of a statement cast only in terms of hope and expectancy, given the regulatory and forecasting failures of the past and the degree of uncertainty that clouds the calculus of both the demand and the supply sides of the market?

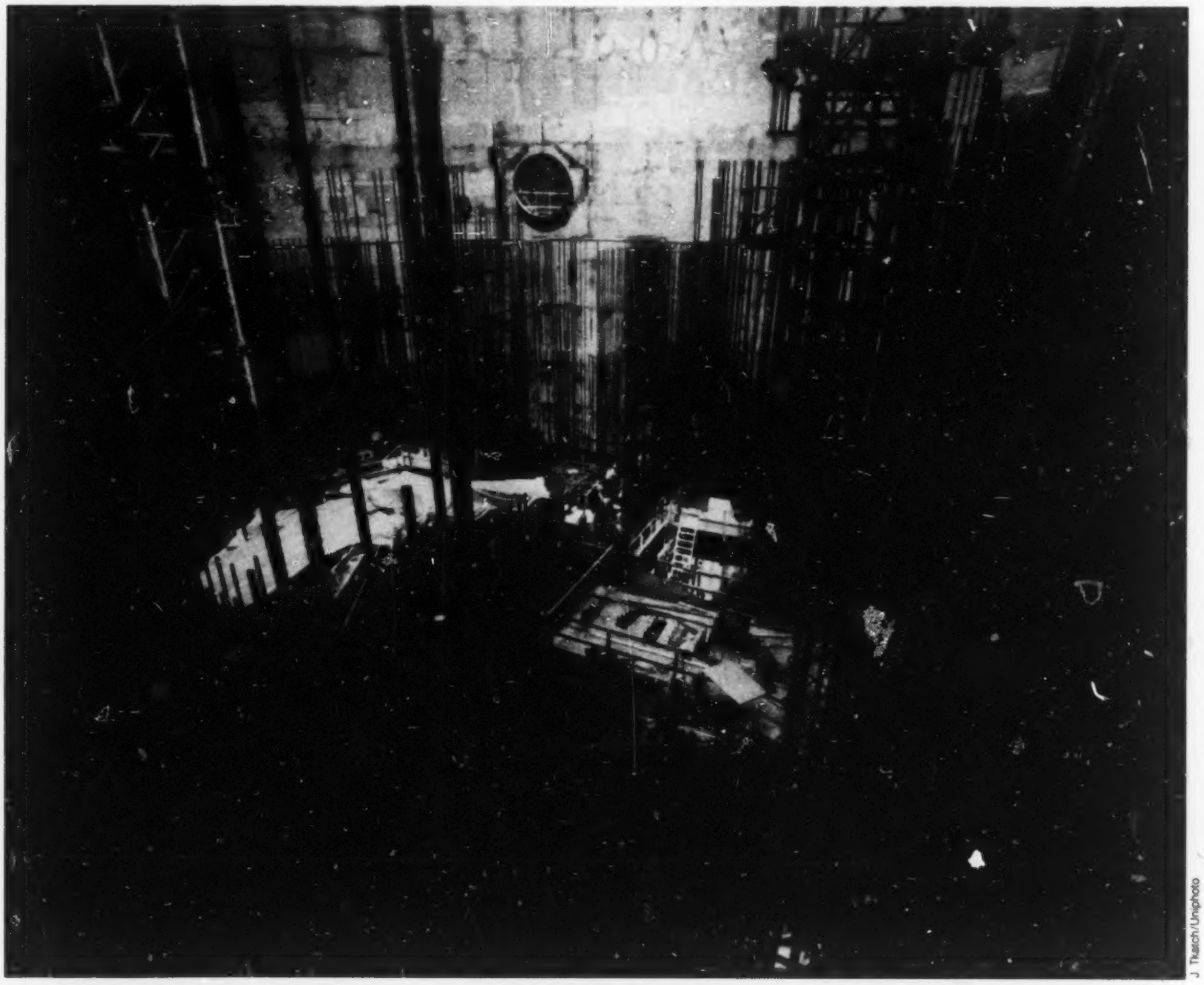
At the same Senate hearing, testimony was offered demonstrating the incredible range of forecast opinion concerning the future rate of electrical demand, all based upon essentially the same data. At the low end is a negative growth projection that is linked to assumptions concerning the effectiveness of certain demand management strategies;[7] at the high end is a rate of growth projected at 4.5 percent for the period 1983 through 2000.[8]

These are, of course, differences that make a difference. As Smith pointed out, even a "2.0 percent difference in average annual growth creates a 150,000-megawatt difference in new capacity requirements in 2000."[9]

Supply-Side Uncertainty

The supply-side uncertainty is tied to whether the capacity now under construction or planned may be cancelled or deferred. Utility managers have developed an understandable lack of confidence that regulatory commissions armed with hindsight (which we know is better than foresight by a damn sight) will subsequently confirm their investment decisions and permit adequate rate allowances. Given the existing oversupply situation and a continuing hostile regulatory environment at the state level, it is questionable whether the currently planned construction programs can be completed under tolerable financial conditions. If these construction programs lag, respectable analyses suggest that shortfalls could begin to materialize in the early to mid-1990s.

Another imponderable concerns



J. Tkatch/Uniphoto

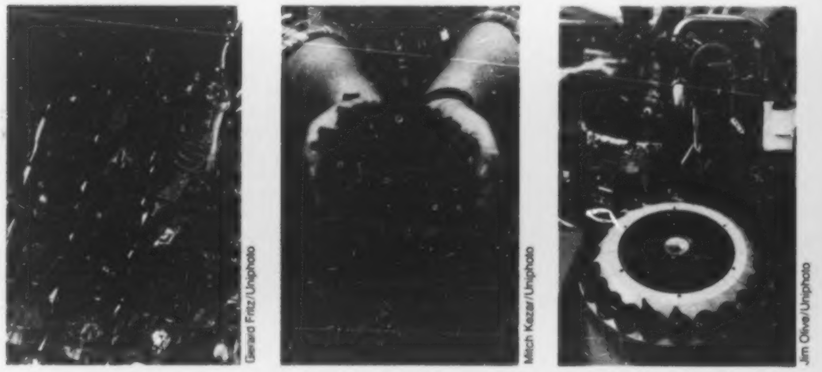
What obligation does a utility have to build additional capacity to ensure adequate service?

the contribution to requirements that may be expected from small power production and cogeneration. Recent studies conducted by the Gas Research Institute conclude that "as much as 27,000 additional megawatts of generating capacity in industrial applications and about 15,000 megawatts in the commercial sector could economically be provided by cogeneration installations by the year 2000."[10] An article in *Electric Perspectives* reports studies that suggest even greater potential for cogeneration alternatives.[11] Should these megawatts materialize (in the form of available kilowatt-hours or significantly reduced industrial demand), their contribution will have a significant influence on the need for central station power generation in the 1990s.[12] But can utility managers who bear a service obligation count on these supplies when they have so little influence or control over the decisions that govern the timing and scale of investment in these power sources? Even the most ardent advocates of diversified power sources must acknowledge that uncertainty concerning the extent of the supplies which may ultimately be "offered" can sometimes significantly complicate utility planning.

A Flexible Rule

With this background in mind, let us return to the central question—what obligation may an electric utility be found to have to invest in additions to capacity to assure adequacy of service? The standards of reasonableness and adequacy, which accompany the statutory and common law expressions of the duty to serve, have a lot to do with the answer to this question.

The teaching of the case law is that the reasonableness standard,

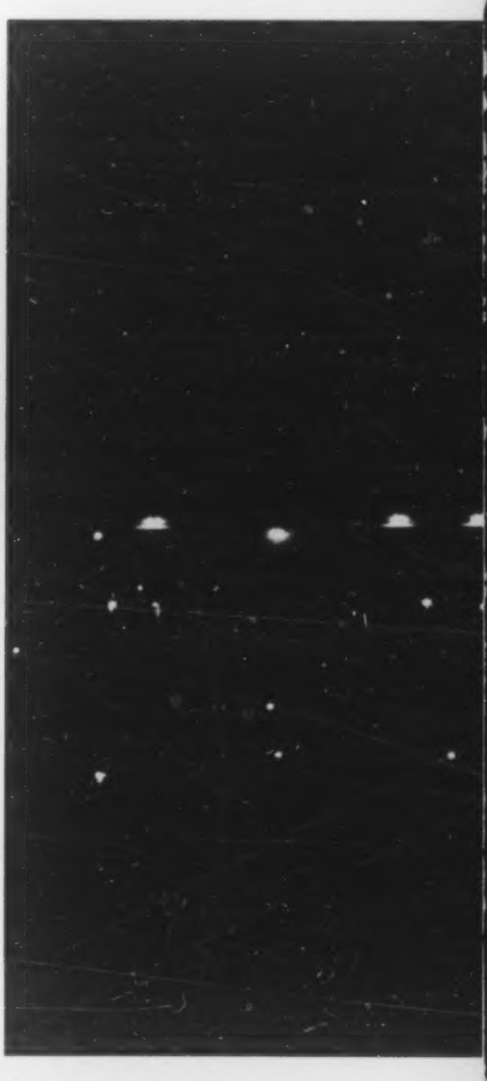


Gerard Fritz/Uniphoto

Mitch Kezar/Uniphoto

Jim Olive/Uniphoto

If an industrial customer wants to shop around, does it have "prodigal rights?"



Most utilities have switched to low-growth planning strategies to get the regulators off their backs and to whittle down any overcapacity.

which guides the enforceability of the duty to serve, is a flexible rule that will be tailored to the circumstances of each utility to which it applies and may change over time as circumstances change. This flexibility gives room to construct defenses to actions by regulators or private litigants designed to force utilities to take certain steps to improve or extend service or to impose liability for perceived failures. It must be acknowledged, however, that the very flexibility of the standard is double-edged, and it is difficult to predict with a great deal of confidence how the duty may be administered. Reasonableness, like beauty, is often in the eye of the beholder.

Nevertheless, it would seem that, in applying the test of reasonableness to these times and to these market circumstances, the general answer to the question whether a utility may be held to an obligation to invest in new capacity is probably "no" or, at least, not until after it becomes apparent that alternatives to such investment will be unavailable or (in the case of demand management strategies) ineffective.[13] For the present, therefore, it seems to me that the current low-growth, "wait-and-see" strategies adopted by most utility managers do not run much legal risk of conflict with the utility's duty to serve.

Future Trends

Throughout the remainder of this decade and into the next, we should expect that the wholesale or bulk power markets will grow to be even more significant than today. As utilities "wring out" the present excess capacity, they will become, through their contractual bonding, more interdependent. Cogeneration and small power production can be expected to grow as well—although no one can confidently say to what extent. Again, the relationship between supplier and user will be expressed in contractual terms (although in these instances the set of terms will sometimes be dictated by state regulatory agencies).

As a consequence, the role of the power sales contract is likely to take on added significance in the future. This development will have increasing importance in determining the effective discharge of a utility's obligation to serve.

The much maligned National Electric Reliability Council (NERC) forecast is currently projecting a 27 percent increase in demand by 1994. Given past forecasting failures, it may be tempting to discount such projections (and many do). It is important to observe, however, that the NERC forecast is now in the middle-to-low range of forecast opinion and that actual demand experience in 1984 exceeded NERC projections for the first time in over ten years of forecast planning.

For the utility industry to satisfy a 27 percent demand growth by 1994, it must keep all current construction programs on schedule. Failing that, it must get much more than is now anticipated out of demand management strategies or attract alternative supplier entry into the bulk power markets to an

Jeff Zaruba/Folio, Inc.

extent far greater than is now foreseen. Moreover, should this mid-range level of demand growth materialize, many believe utilities in several regions will soon have to commit to new construction to avoid shortfalls.[14]

Thus, as we draw closer to the 1990s and press upon construction lead times, one might anticipate increasing attention at the state level to questions concerning the adequacy and reliability of power supply. Regulatory scrutiny will likely focus not only on the raw figures of supply/demand balances but also on the reasonableness of the steps taken by the utility to avoid or ease the consequences of a potential shortfall in service.

Those utilities that have adopted (or believe themselves to have been coerced by their regulatory commissions into adopting) low-growth planning strategies are heavily reliant on filling marginal supply needs with third-party purchases in the bulk power market. Whether such a utility passes the test of "reasonableness" and is adjudged as having faithfully discharged its service obligation will depend on the regulatory commission's view as to how well the utility has done in lining up suppliers. In addition to the totality of the power supply under contract, examination will likely be made of the choices made in selecting from any alternative suppliers and the terms under which these supplies have been secured. Without actual alternative contracts in hand or standard offer terms defined in advance, this could prove to be a difficult undertaking.

As bulk power markets grow, so too will the complexity of the contractual relationships of the participants. A flourishing and increasingly competitive wholesale market (whether brought about by regulatory reform or simply as the product of continued growth in voluntary transactions now underway) will likely reflect a full range of marketplace relationships from spot sales to long-term requirements contracts. The longer the duration of the contract, the more likely it is that the terms will be uniquely adapted to the circumstances of the supplier—particularly if that supplier is another utility that may be subject to service calls on the same capacity that is committed under the contract. It is easy to see, therefore, that any state commission proceeding that starts into an examination of these contracts can quickly become quite complex and perilous. Needless to say, the potential for second-guessing is high.

A Lawyer's Point

There is in all of this an interesting lawyer's point that might be made here. The bulk power markets are regulated by the Federal Energy Regulatory Commission (FERC). Under the terms of existing law, this agency is called upon to pass on the justness and reasonableness of wholesale power sale arrangements. Not only the level of rates, but all aspects of the relationship between the parties to the transaction come within FERC's jurisdictional powers to approve or alter as FERC's view of the public interest may indicate. Accordingly, quarrels by state agencies with the terms of power sales contracts or attempts to impose "consequences" for perceived failures in the service terms of bulk power arrangements could run up against constitutional barriers to state action. Moreover, the constitutional barrier might be somewhat strengthened were FERC to attempt to standardize certain terms of requirements service.

On the other hand, one must acknowledge that the line between federal and state responsibility is not as brightly drawn as it was once thought to be. If actions are cloaked in the exercise of state enforcement of a service obligation imposed by statute on enfranchised utilities, or otherwise carefully dressed in well-recognized state responsibilities of high public interest value, the line may become barely discernible. Also, state regulators may resort to the "black box"

Long-distance bulk power sales may be the wave of the future.

Les Moore/Uniphoto

of rate-of-return regulation to reflect their displeasure. Utility managers are not, therefore, likely to gain much confidence from their lawyers that constitutional constraints would provide an effective shield against hostile action by a state commission dissatisfied with the results of its regulated utility's participation in the bulk power market.

State Commissions and Bulk Power Deals

For this reason and others mentioned below, utilities may find it to their advantage to involve their state commissions at an early stage in the utility's strategic plans for participation in the bulk power market. Several positive outcomes are possible from this involvement, in addition to reducing the risk of adverse hindsight judgments.

For one thing, utilities will be able to test whether their regulatory commissions will accept the proposition that the duty to serve can be effectively discharged through the device of power sales contracts. However obvious the point may seem to be, it may be a good idea to get the state commissions to confirm on the record that the duty to serve does not equate with a duty to invest in new capacity in the presence of markets that have competing alternative suppliers.

There are important attitudinal values to be gained as well. If utilities are able to present themselves to their regulatory commissions as effective agents acting on behalf of their ratepayers to secure the most advantageous price and service terms from third-party suppliers, the prospects for obtaining improved returns on already invested capital might significantly improve. Also, with public policy reinforcement of a strategy that depends on bulk power markets for some portion of the utility's marginal supply needs, utilities would gain confidence that they will be successful in fending off later objections that third-party supply costs are greater than would have resulted had the utility invested in "native" generation. State commissions may be perfectly willing to accept some risk of price penalty rather than have to deal with the difficult problems of attempting to put into rate base capacity that later turns out to be not needed. If so, utilities should find some way of "getting it in writing." Such regulatory blessings may also prove to be of considerable advantage, although not an absolute bar, in any future private litigation with industrial customers or others seeking to impose liability for any power deficiencies alleged to stem from unreasonable reliance on third-party suppliers.

Utilities may find it to their advantage to involve their state commissions at an early stage in the utility's strategic plans for participation in the bulk power market.

There is yet another advantage in securing early involvement of state commissions in a utility's strategic plan for participation in bulk power markets. Should it turn out that alternative suppliers do not materialize or cannot be contracted for on acceptable terms, the need for the utility to proceed with its own plans for capacity additions becomes evident. At this point, the utility could choose either to undertake the investment itself, in joint association with others, or to put out a solicitation for bids under terms which could allow for commitments by third parties. The duty to serve could be satisfied under either alternative, but again the utility may be well advised to seek regulatory confirmation of its plans in order to foreclose subsequent objections to the need for the new facility or the terms of any contract with third-party suppliers. If alternative suppliers are not present in the bulk power markets and third-party investment is not attracted to a solicitation, it is possible that a utility could be obligated to invest in additional generation under its duty to serve—but then only as a last resort. In this event, however, the so-called "public utility bargain" between the utility and its regulators may be successfully re-established to govern the investment and assurances obtained "up front" that appropriate rate treatment will be forthcoming even if it should ultimately turn out that the capacity was more than was needed.

Of course, the very process of sharing with regulatory agencies at an early stage a utility's planning strategies for meeting its service obligations risks disapproval and, possibly, an ordered redirection. It will involve for many a concession of management discretion, which, in the past, had been subjected to regulatory evaluation only in after-the-fact rate proceedings seeking to validate actions already taken. By shifting this regulatory examination to the front-end of planning, however, utilities may be able to forge common values and understandings with their regulators about how to meet future requirements. Such a definition of mutual

LONG-RANGE ENERGY FORECASTS

Several long-range energy forecasts have been published over the past three years. These forecasts have been prepared by diverse organizations using a variety of methodologies. In some cases, they reflect policy inclinations while in others they represent efforts to identify a "most likely" energy future. As a group, they encompass the range of forecasts widely viewed as plausible for policy and planning purposes.

The range of projected growth rates has narrowed considerably over the past few years. Only "least-cost" studies, such as those of the Audubon Society and Roger Sant, indicate substantially lower growth rates for energy consumption than the consensus. Siegel and Sillin, the mavericks among analysts, project both higher economic growth and higher electricity consumption.

A review of projected growth rates computed from the base year cited in the individual reports and ranked by electricity/gross national product (GNP) growth ratios is provided in Table I. The mid-case or base scenario was chosen when possible. Table I shows average annual growth rates through the year 2000 or other end-year indicated.

Contributed by the Economics Department, Edison Electric Institute.

Table I
Average Annual Growth Rates
Selected Indicators

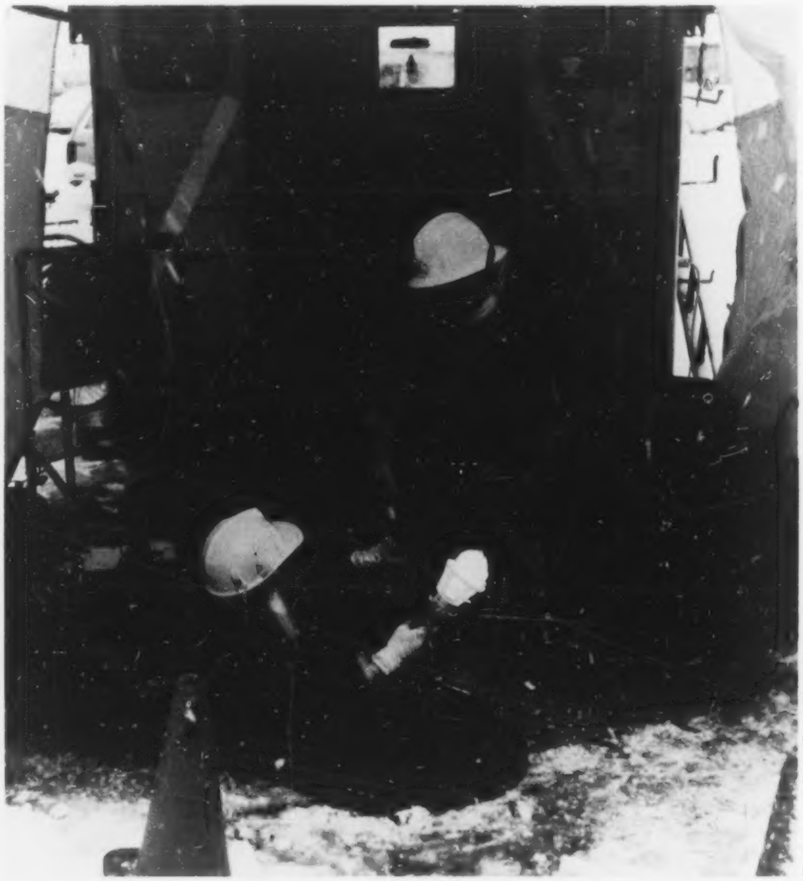
	Real GNP	Primary Energy	End-Use	Elec.	Peak Demand	Elec/GNP Ratio
SIEGEL (1983-2000)	3.7	n/a	n/a	4.5	n/a	1.22
EIA (1985-1995)	2.7	1.8	1.2	3.2	n/a	1.18
DOE (1982-2000)	2.8	1.3	0.9	2.8	n/a	1.00
DRI (1985-2000)	2.6	1.4	1.0	2.6	2.1	0.98
EL.WORLD (1985-2000)	2.7	n/a	n/a	2.6	2.5	0.96
COM (1984-2000)	2.5	0.8	0.5	2.4	n/a	0.96
NCA (1982-1995)	2.5	1.4	1.2	2.3	n/a	0.92
AES (1984-2000)	2.8	n/a	0.9	2.6	n/a	0.90
WHARTON (1985-1995)	2.9	1.7	n/a	2.5	n/a	0.86
GRI (1985-2000)	2.7	1.3	1.2	1.8	n/a	0.67
CON (1984-2000)	3.3	1.1	0.7	2.0	n/a	0.60
SANT (1980-2000)	2.6	0.7	0.5	1.5	n/a	0.58
AUD (1980-2000)	2.5	−0.4	−0.3	−0.8	n/a	−0.32
BANK (1982-2000)	n/a	n/a	n/a	2.9	2.5	n/a
NERC (1985-1994)	n/a	n/a	n/a	2.4	2.2	n/a

Notes:

AES:	Applied Energy Services, Inc., "U.S. Electricity Markets in the 1990s," Testimony Prepared for the Committee on Energy and Natural Resources, July 25, 1985.
AUD:	National Audubon Society, "The Audubon Energy Plan 1984," July 1984 (Conventional Baseline Scenario). This report emphasizes the effectiveness of policy options limiting growth and energy consumption; it should not be viewed as a forecast of the most likely path of future growth.
BANK:	Chemical Bank, "U.S. Electric Utility Industry Outlook to the Year 2000," February 1984.
CON:	Conoco Inc., "World Energy Outlook Through 2000," April 1985.
COM:	Joseph F. Gustaferro, U.S. Department of Commerce, "U.S. Energy for the Rest of the Century," July 1985.
DOE:	U.S. Department of Energy (DOE), "Energy Projections to the Year 2010 (NEPP IV)," October 1983.
DRI:	Data Resources, Inc., "Energy Review," Summer 1985.
EIA:	U.S. Energy Information Administration (EIA), "1983 Annual Energy Outlook," January 1985.
EL.WORLD:	Electrical World, "36th Annual Electric Utility Industry Forecast," September 1985.
GRI:	Gas Research Institute, "1985 GRI Baseline Projection of U.S. Energy Supply and Demand to 2010," November 1985.
NCA:	National Coal Association, "Coal Markets in the Future," March 1984.
NERC:	North American Electric Reliability Council, "Electric Power Supply and Demand 1985-1994," 1985.
SANT:	Roger W. Sant, et al., "Creating Abundance: America's Least Cost Energy Strategy," 1984 (Business As Usual Scenario).
SIEGEL:	John R. Siegel and John O. Sillin, "Rethinking Utility Strategy Under Conditions of High Growth," *Public Utilities Fortnightly*, September 13, 1984. Also, conversations with Sillin, February 1986.
WHARTON:	Wharton Econometric Forecasting Associates, "Long Term Forecast," December 1985.

Summary:

- **GNP assumptions** to the year 2000 call for an average annual growth rate in the 2.5 to 3.7 percent range. The early years of the forecasts to 1990 should see faster growth than the 1990s, with a projected growth rate to 1990 averaging over 3 percent. Slower economic growth averaging 2.6 percent is expected in the 1990 to 2000 period. This compares with an average annual growth rate of 2 percent in the decade of 1973 to 1983.
- **Primary energy consumption** will rise by about 1 to 2 percent annually during the forecast period, by most projections. Governed by economic growth assumptions, energy use grows faster in the early term of the forecast. From 1973 to 1983, energy consumption declined by about 5 percent or 0.5 percent annually. Primary energy consumption increased by 5 percent in 1984, the first annual increase since 1979.
- **End-use consumption** changes by −0.3 to 1.2 percent annually to the year 2000, less than half the rate of growth projected for electricity use.
- The majority of studies project that **electricity consumption** will grow at about the same rate as GNP to 1990, or about 2.2 to 4.5 percent annually, but slightly below GNP in the decade of the 1990s, in the 1.6 to 3.5 percent range. This compares to a 2.3 percent annual growth rate in the 1973 to 1983 period.
- The **electricity/GNP ratio** to the year 2000 ranges from a high of 1.2 projected by Siegel and Sillin to Audubon's indication of a negative growth ratio of electricity consumption to GNP. The average ratio drops slightly in the decade of the 1990s.



Ted Polumbaum/Boston Edison Company

The utility's duty to serve is defined by law.

objectives may prove essential if utilities are in future years to return to planning strategies that contemplate new central station construction.

There is in all of this, regrettably, no certainty that common values may emerge. State regulatory commissions may refuse to accept front-end responsibility for the strategic choices made by utilities subject to their supervision. Or a later commission may attempt to disavow any "commitments" made by a predecessor. Nevertheless, it would seem that utility managers would stand to gain more than they would lose for trying. And so would the public. Sustained regulatory confrontation of the type that has characterized utility relationships with their regulators in the 1970s and in the first half of this decade simply must yield to produce a sense of common purpose if the nation's future requirements are to be met on acceptable terms. To continue on our present adversarial course is to risk forcing utility planning into shorter and shorter planning horizons and to impose unseen costs on shareholders and ratepayers alike.

Serving an Increasingly Mobile Industrial Load

This is perhaps the proper place to offer some comment on the retail service obligation owed by utilities to their industrial customers. It would seem obvious that some recognition in the state forum must be given to a trade-off between obligation and opportunity. If public policy reduces the utility's market power by increasing the supplier choices of industrial customers, there ought to be a corresponding reduction in the duty to serve or, at least, modification of the terms of service.

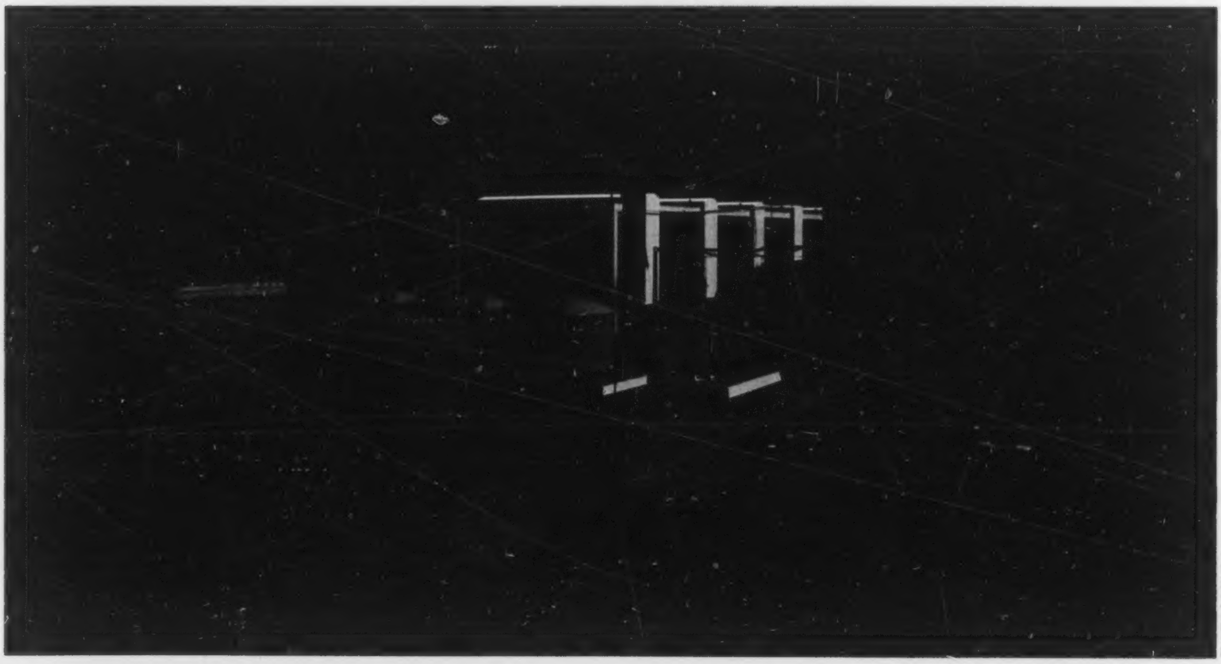
Thus, an industrial customer that desires to leave a system in favor of an alternative supplier might, in the usual case, be required to forfeit the unqualified right to return to the system on the same price and service terms applicable when it left, or it should be required to pay for its "prodigal rights." A number of industrial customers and their representatives have been heard to accept this proposition. They should be taken at their word. Others who have not should be called to do so.

Traditionally, the service duty owed to all applicants has been construed to be a qualified obligation permitting utilities to impose reasonable conditions without offending standards of nondiscrimination. It is, of course, impossible to predict with any degree of certainty in any individual state what tolerance lies between reasonable condition and discriminatory practice. However, the system of backup service and reservation fees for cogenerators developed over the last few years under the auspices of the Public Utility Regulatory Policies Act program may prove to be a useful guide.

The law and practice here are still evolving. Yet, as industrial customers become more self-reliant through their own power production activities or as they may become more mobile participants in the bulk power market, state regulatory commissions, equally confronted with the problems of distributing fixed costs to the customers who remain behind, may prove to become more ally than antagonist to the local utility. It may be possible through anticipatory rate schedule filings to work out in advance appropriate conditions to the service obligation that are mutually satisfactory to all parties of interest. State commissions that preclude such filings should nonetheless be solicited for advice, perhaps taking the form of an advisory opinion or statement of policy. The sooner the rules of the game are established, the better it will be for both the utility industry and the industrial customer.

Final Thoughts

Today's planning strategies incline utilities to build small increments of capacity that more closely follow changes in the load profile. Presumably, scale economies are some-



If fuel prices go up, big central station power plants may again look good. Meanwhile, strategy calls for building in small increments.

Rick Brady/Uniphoto

times lost in this process. Also, facilities with higher ratios of operating to capital costs will tend to be selected to avoid rate "lumpiness" and to minimize financing difficulties. Given the trauma of the construction programs of the 1970s, the present day overcapacity, and uncertainty about growth, this is an understandable and also sensible course of action. But sometime in the future, should fuel costs again escalate, the evident scale economies of conventional central station generation may recover respect and develop adherents in regulatory halls as well as corporate offices.

In the past, utilities have turned increasingly to joint ventures and unit power sale agreements to manage investments in large-scale facilities and to keep their individual commitments at acceptable levels. Public power's preferred access to the capital markets has made for mutually attractive alliances between private and public power. The results have not always been satisfactory, however. Both management and regulators have acknowledged a diminution of control, which is the necessary byproduct of contractual arrangements that cede to others responsibility for the resource allocation decisions previously accomplished through a single vertically integrated entity.

However necessary and appropriate these arrangements have proved to be in the past, the use of consortia for managing investments in new baseload generation of any significant scale must be conceded by all parties to be the likely course of the future. Public policy makers should recognize these arrangements for what they typically are—combinations of utility interests joined across political and territorial boundaries under the rule of contract. By their very nature, these arrangements erode the concept of "local" management and "local" regulation. They also invite valid questions whether, in the words of economic jargon, the efficiency properties of the contracts will match the firm efficiencies of a vertically integrated firm or single ownership organization.[15] In other words, if these types of arrangements become more and more dominant in the long run, will they do as good a job in allocating resources and will they otherwise benefit the public good?

Stacy Pick/Uniphoto

Local management and regulation may give way to regional power production and distribution.

It is appropriate to point out here that the recipients of the power output of the joint enterprise are often, for financial reasons, tied to the project by contractual terms more securely than if all participants were part of a single enterprise. Yet, for reliability of service purposes, these bondings are necessarily less complete. It is not possible to encompass or anticipate in contractual terms all circumstances. Moreover, the disparate interests and legal responsibilities of the parties to the contract, whose relationship with each other may be confined to a single deal, would work against the development of terms that seek to impose on the consortia members the same fidelity to service that a single firm with clearly defined franchise rights may feel obligated to provide.

In the long run, public policy makers may come to believe that the traditions of local management and regulation should yield to allow for greater concentration and strengthened market power. This conclusion would be hastened if it turns out that competitive incentives or other economic and regulatory influences fail to foster a sufficiently vital and renewing bulk power market capable of capturing minimum scale economies in generation and transmission.

Quite conceivably, the electric utility industry could then go through a phase of considerable consolidation, combining distribution territories into larger, more regionally sized areas. The combinations of interests in generation and transmission, which now take the form of pooling arrangements and joint financings, could also be transformed to provide for large regional power producers. The traditions of local management and regulation of the distribution function may drag more strongly against the tendencies to combination of service territories and incline more favorably to consolidations of power producers.

Public policy makers may come to believe that the traditions of local management should yield to allow for greater concentration and strengthened market power.

Whatever future path is followed, however, whether it is the one leading to greater competition or greater concentration, the utility industry at the end of this century is likely to be significantly different than the one we know today. Who has the obligation to serve at that time and by what means reliable and adequate service will be assured will have to be seen.

Notes

1. *Electric Perspectives,* Spring 1985, contains an excellent summary of the current debate attending the most controversial of the "pro-competitive" initiatives. See Douglas C. Bauer and Bruce S. Edelston, "Mandatory Wheeling: Is Competition in the Nation's Best Interest?" pp. 2-11.

2. Perhaps the dearth of comment is manifestation of what Priest refers to as "[t]hat casual faith with which Americans make use of electricity." See A.J.G. Priest, *Principles of Public Utility Regulation,* Vol. 1 (Charlottesville, Virginia: The Michie Company, 1969), Chapter 6, pp. 227-283.

3. This article provides only a summary of the legal expression which defines the duty to provide retail service. For those who wish to examine the matter further, they are referred to Priest, *Principles of Public Utility Regulation,* Vol. 1, Chapter 6, footnote 3, and, Note, "The Duty of a Public Utility to Render Adequate Service: Its Scope and Enforcement," *Columbia Law Review,* Vol. 61 (1962), p. 312. Questions concerning the existence or nature of a wholesale service obligation as may be imposed on bulk power supplies are discussed in F. Norton and M. Spivak, "Wholesale Service Obligation of Electric Utilities," *Energy Law Journal,* Vol. 6 (1985), p. 179.

4. See *e.g.*, Columbus and Southern Ohio Electric Co. *v.* Public Utilities Commission, 64 Ohio St.2d 175, 413 N.E.2d 1208 (1980), *appeal dismissed* 452 U.S. 933 (1981) involving an ordered purchase of replacement power during a coal strike.

5. For some utilities, of course, capacity margins are nowhere near the national average. For them the decision whether to invest in new native generation or to rely on alternative strategies is more immediate.

6. "Electric Power: Potential for Shortages in the 1990s," Hearings before the Committee on Energy and Natural Resources, United States Senate, July 23 and 25, 1985 (S. Hrg 99-253), at 188.

7. National Audubon Society. *Audubon Energy Plan 1984,* July 1984 (Conventional Baseline Scenario).

8. John R. Siegel and John O. Sillin. "Rethinking Utility Strategy under Conditions of High Growth," *Public Utilities Fortnightly,* September 13, 1984.

9. "Electric Power" Hearings.

10. *Ibid.*, Testimony of Dr. Daniel A. Dreyfus, vice president, Strategic Analysis and Energy Forecasting, Gas Research Institute.

11. See John McCaughey, "Cogeneration: Sweet Dream or Nightmare?" *Electric Perspectives,* Winter 1985, pp. 8-15.

12. Department of Energy studies suggest that even contributions of this magnitude will not, however, obviate the need for significant increments to current capacity. See *A Look at National and Regional Electric Supply Needs,* by J. Steven Herod and Jeffrey Skeer, Office of Coal and Electricity Policy, U.S. Department of Energy, 1985.

13. As Bill Hogan, director of Harvard's Energy and Policy Center, has observed, "The principal lesson for forecasting and planning is to expect possible changes in the 1990s but recognize the importance of uncertainty in present planning decisions." This admonition to planning should have equal weight and influence in any evaluation of a utility's present-day obligation to initiate new investments in capacity.

14. There are significant differences in peak demand forecasts for individual regions. NERC foretells a 1.2 percent growth in the Middle Atlantic area and a 3.6 percent growth in the South Central region.

15. For a scholarly elaboration of this point and an overall excellent discussion of the deregulation issue, see Paul Joskow and Richard Schmalensee, *Markets for Power: An Analysis of Electric Utility Deregulation* (Cambridge, Massachusetts: MIT Press, 1983).

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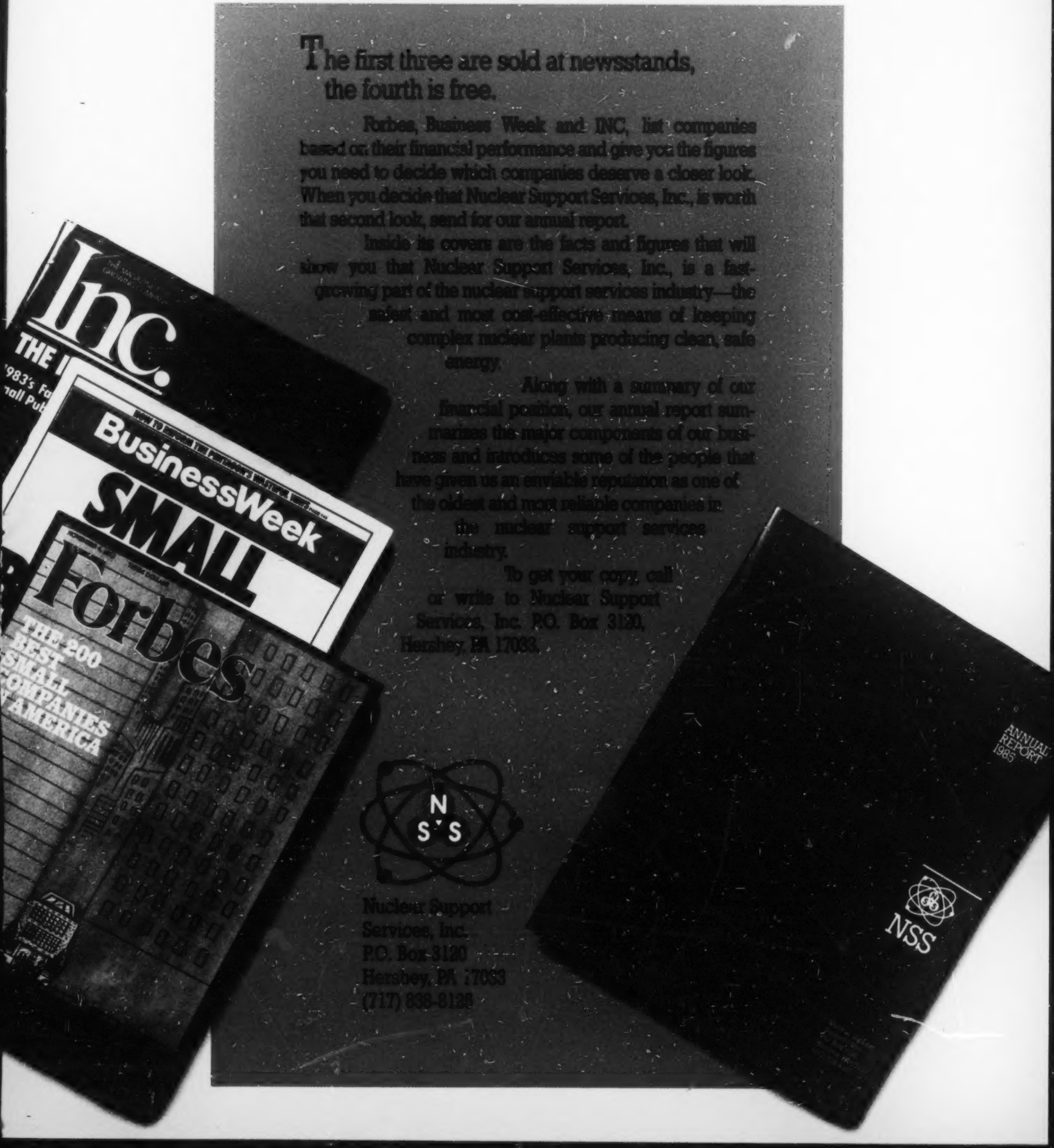

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Lawrence Susskind and Allan Morgan

Improving Negotiation in the Regulatory Process

Old-style bargaining and fighting it out in the courts are no way to make the rules.

Talk about regulatory reform today usually focuses on ways of cutting down government involvement. An equally important but often neglected need, however, is ensuring that the wisest possible regulations are adopted when federal and state government must intervene.

For the foreseeable future, it is likely that government will keep its hand in the siting of electric generating facilities, in the pricing of electric power, in the setting and enforcement of environmental quality and public health standards, and in the guaranteeing of basic services to the poorest of the poor. When portions of the population do not have the resources to compete effectively, when the externalities of private action are not priced properly, when common resources must be protected or when monopolies are involved, we expect government to intervene. When it does, its focus should be on balancing public and private interests.

But current administrative processes—rulemaking, permitting, licensing, ratesetting, etc.—often fail to produce the wisest balance in the eyes of those most affected. These processes are time-consuming and expensive. They are often not definitive, leading in many instances to drawn-out court battles. Their adversarial nature often exacerbates already contentious relationships. They produce outcomes that are hard to enforce. And, finally, they often result in decisions that are technically unsound.

How Big is the Problem?

Consider a typical licensing or ratesetting situation:

A private company, let's call it POWERCO, needs to alter its services. Based on detailed studies, POWERCO applies for the necessary permits, licenses or rate increases. A regulatory body (perhaps more than one) reviews POWERCO's request. The regulatory agency duplicates the studies that POWERCO commissioned (to ensure an independent analysis of the facts). The agency probably requires POWERCO to submit supplementary information of all kinds. Then, the agency holds a series of hearings. These are run according to a predetermined set of rules designed to ensure that anyone affected by POWERCO's request or by subsequent agency decisions has a chance to "review and comment." Intervenors representing various parties make presentations at the hearings—usually bolstered by still further studies undertaken by still other experts. The intervenors are free to make any claims they like—no matter how extreme. POWERCO is probably not given an ample opportunity to rebut the claims of the intervenors.

The agency must then retreat to the privacy of its chambers and decide whether or not to grant POWERCO's request. While there are published guidelines and policies presumably guiding the officials involved, the agency has a great deal of discretion. When the agency announces its final decision, either the intervenors or POWERCO may decide to take legal action. The agency, by the way, is not obliged to explain the rationale for its decision. The courts will take a "hard look" at both the processes and the decisions of the agency and may send everyone back to begin again.

The story tends to be the same whether the company is requesting permission to build a new electric generating facility, to dispose of waste byproducts, to alter its rate structure or to change the information it routinely makes available to its customers. Whatever the details, the plot is familiar: (1) an agency of government charged with balancing public and private interests entertains a request from a private company; (2) the agency undertakes an independent review of the proposed action; (3) the general public is given a chance to make its views known; and (4) the agency offers a final determination. Then, more often than not, (5) the entire matter goes to court.

The courts, unfortunately, are often in no position to second-guess the regulatory agency. Indeed, the whole legal concept of determining who "wins" and who "loses" seems inappropriate when the goal is to balance public and private considerations. What is

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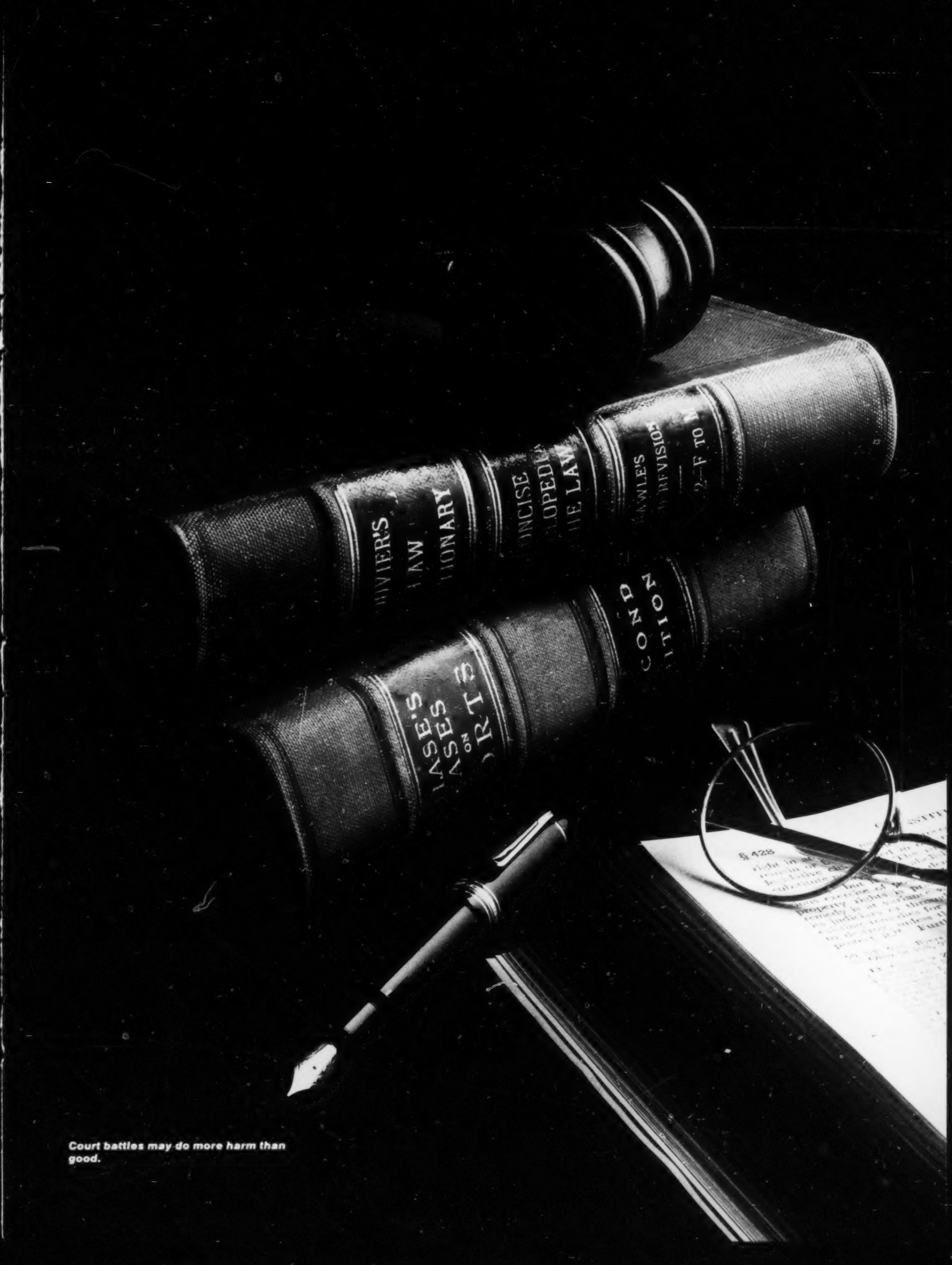
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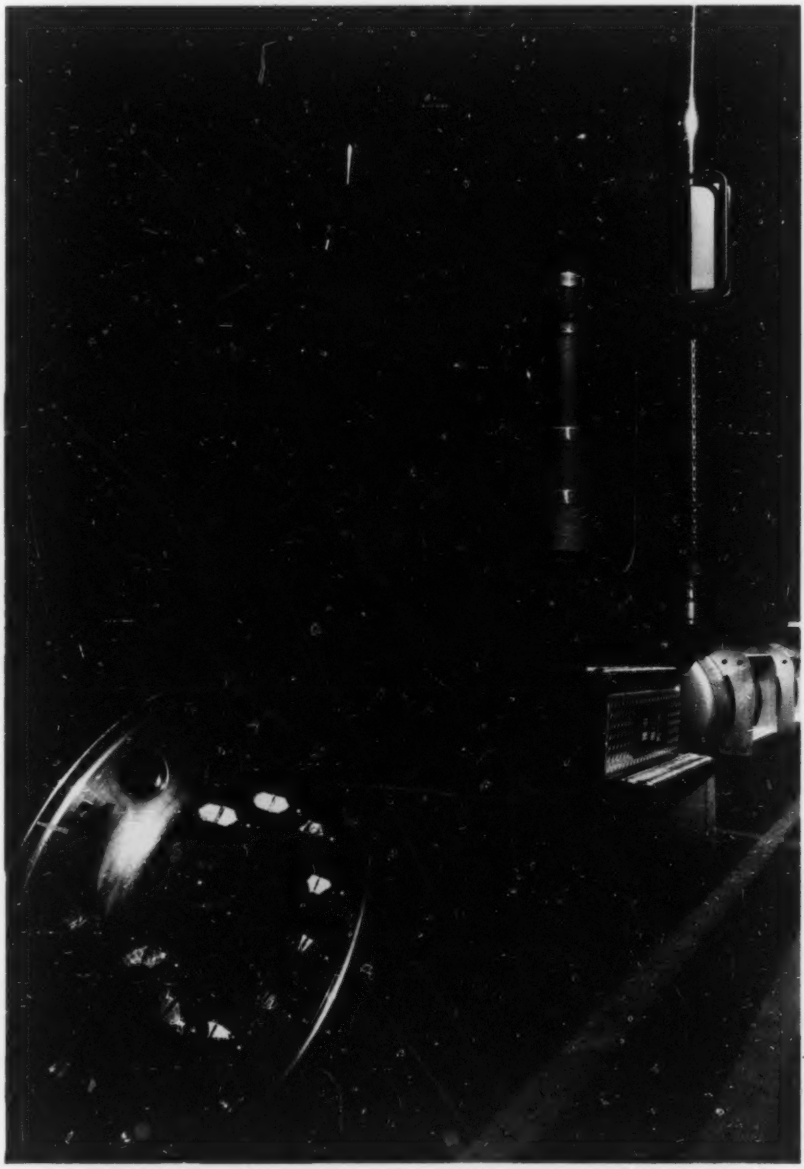
Court battles may do more harm than good.



EPA's first negotiation experiment involved truck engine manufacturers and a rule on pollution control under the Clean Air Act. The 21 negotiators reached a consensus and no court action was necessary.

Bruce Waters/Uniphoto

needed is a better mechanism for resolving the legitimate differences that emerge.

The adversarial intervenor process encourages all parties to exaggerate their claims. Each seeks to leave as strong an impression as possible on the regulators. The adversarial process also encourages the parties to discredit each other's scientific or technical studies. Indeed, the tendency in such situations is to spend a great deal of time and money undermining the claims of others rather than improving the quality of the information available to everyone. Unfortunately, challenges to the technical work submitted by others merely confirm the general public's view that all studies are nothing more than polemics prepared on behalf of one client or another. This jockeying is very dangerous: it can lead to politically expedient but technically or economically unsound decisions with disastrous environmental or fiscal consequences.

How Did We Get Into This Mess?

Much has been written about the rise of "social regulation." In general, the regulatory process has grown more cumbersome over the past 25 years as Congress and the courts have increased the opportunities for interested parties to be heard and to challenge agency decisionmaking. The scope of agency action, in the meantime, has expanded as Congress has generated more and more programs aimed at protecting public health and safety, broadening the guarantee of rights and opportunities for those least able to provide for themselves, redistributing economic gain, and managing the overall economy. State governments have followed suit, almost doubling the reach of regulation.

We are facing something of a paradox. Many of the steps taken to enhance the legitimacy of agency decisionmaking have caused substantial delay and inefficiency—undermining the very credibility they were meant to enhance. Through the Federal Advisory Committee Act (FACA), Sunshine Laws, the Freedom of Information Act, and elaboration of the Administrative Procedure Acts at the federal and state levels, reformers have tried to ensure timely notice, access to information, and agency accountability. They have relied on the courts to enforce these standards. These same provisions, however, have made it possible for many of the same interest groups demanding these reforms to delay regulatory proceedings through dilatory procedural challenges and to circumvent unfavorable decisions through judicial appeal. Now, all sides are looking for ways to increase the efficiency of the regulatory process while maintaining its legitimacy. In addition, most observers favor only those reforms that will reinforce the importance of scientific and technical analysis upon which so many agency decisions ought to hinge.

In the face of these concerns, negotiated approaches to regulation are gaining in popularity. The Environmental Protection Agency (EPA), the Federal Aviation Administration, and the Occupational Safety and Health Administration have all experimented with negotiated rulemaking. Negotiated ratesetting has been tried in the state of Washington. Massachusetts, Wisconsin, and Rhode Island have incorporated mediation into their state facility siting processes. EPA is exploring mediated approaches to Superfund enforcement. The federal district courts have pioneered the appointment of special masters to serve as mediators in complex civil disputes. California has been using private judges and other forms of arbitration to supplement agency decisionmaking. The array of experiments and demonstrations continues to grow.

All of these negotiated approaches to regulation have several things in common:

- Senior representatives of the "stakeholding" parties participate directly in informal face-to-face give-and-take, assisted by a facilitator or mediator.
- The goal is to achieve a consensus, not a majority vote.
- The product of negotiation is a draft agreement that must still be reviewed by the leadership or the constituents of the agencies or organizations involved.
- The negotiated agreement is subject to the normal review and comment procedures prescribed by statute.

> ***The adversarial process encourages the parties to discredit each other's scientific or technical studies. . . . This jockeying is very dangerous: it can lead to politically expedient but technically or economically unsound decisions.***

Thus, negotiated approaches to regulation are supplements to and not replacements for traditional agency decisionmaking. The assumption, though, is that a consensus reached among all the interested parties through a process of collaborative problem-solving will pre-empt legal challenges and reduce the number of formal comments received to almost zero. The experience thus far, while still limited, suggests that regulatory negotiation can indeed yield wiser actions, more quickly, at lower cost.

Negotiation in the Rulemaking Process

In 1984, some 80 percent of all the rules made by the Environmental Protection Agency were challenged in court. In an effort to reduce the delays, cut the costs, and regain its credibility with environmentalists, EPA decided to experiment with a unique form of negotiated rulemaking.

After an elaborate nomination and screening process, EPA selected for its first demonstration a rule under the Clean Air Act imposing financial penalties on truck engine manufacturers who fail to meet industry standards for pollution control. EPA hired an "outside" convener (ERM-McGlennon Associates of Boston) to undertake a conflict assessment. This assessment involved identifying all the possible parties, contacting them to see if they would like to participate, and preparing an agenda for negotiation. The agency published an advance Notice of Proposed Rulemaking announcing its intention to try this type of negotiated approach and inviting interested parties to participate. A Federal Advisory Committee Act charter was sought and received from the General Services Administration. The agency amassed a $50,000 resource pool (half from private foundations) to help the participants who needed assistance to cover travel costs and to encourage the group to commission whatever joint fact-finding studies it needed to reconcile its differences.

Twenty-one parties joined in the five-month demonstration. EPA and the Office of Management and Budget (OMB) participated directly. A consensus was reached on the key points to be covered by the Clean Air Act rule. When the rule was published, it attracted fewer than half a dozen comments, and no attempt was made to seek appellate review.

One key to agreement was the

Arizona Public Service Company

willingness of the parties to listen to each other. Each "side" shared the information it had and clarified the terms of the "package" with which it could live. EPA, of course, had no obligation to agree to anything with which it was not fully satisfied. In the end, the ability of the parties to agree depended in large part on certain "informal rules" that emerged within the negotiating group. Group members were willing to speak truthfully, they accepted technical information presented by others, and they sought "integrative" or "win-win" solutions that met their primary concerns. After all, the alternative was an EPA-generated rule over which they had little or no say.

EPA's second demonstration was equally successful. Twenty-two parties took about four months to draft a proposed rule concerning the redefinition of emergency conditions permitting exemptions from the provisions of the Federal Insecticide, Fungicide, and Rodenticide Act. Industry, environmental, public interest, and agency participants, with the help of an "outside" convener and a facilitator from the office of EPA's general counsel, reached agreement on the actual language of the proposed rule. The availability of funds from a resource pool was vital to the involvement of certain groups and enabled the entire group to jointly commission an important technical study. Once again, very few comments were received during the formal review and comment period. The rule has not been subjected to appellate review. In detailed interviews at the end of the demonstration, the participants felt that relationships among the parties had improved markedly. No group felt disadvantaged by the experience or by lack of resources. And finally, the draft rule written by the group seemed "better" than what they envisioned emerging from the "normal" process.

While the results of EPA's two demonstrations need to be supplemented by other carefully planned projects before firm conclusions can be drawn, several provisional findings are worth noting:

- Informal negotiations (open to public scrutiny) can produce rules that are both technically sound and appealing to all the groups involved.
- The active involvement of an "outside" convener during the prenegotiation phase of the process can ensure adequate representation and more than acceptable notice.
- The availability of a jointly managed resource pool can eliminate the obstacles to participation for certain groups while encouraging collaborative fact-finding.

Aerial Photos International/Boston Edison Company

Far Left:
In New Mexico, the public service commission is using negotiation to design a plan to avoid rate shock when the Palo Verde nuclear power plant comes on line.

Left:
In Massachusetts, Boston Edison Company has called together a negotiation team to decide how to anticipate and meet future demand in the Boston region.

- Because any group could walk away from the negotiating table at any time (and undermine the advantages of consensus), a less hostile and more cooperative style of interaction was encouraged.

- The group needed a substantive task (*e.g.*, drafting the actual language of a rule) and a deadline (*e.g.*, imposed by EPA) to propel its discussions.

- The proprietary nature of certain data was maintained by funneling it through the mediator, who then summarized it without reference to particular corporate participants.

- Agreement was reached because the participants valued different aspects of each rulemaking differently. They traded across these differences to produce a package that everyone found acceptable, and EPA and OMB ensured that it was based on the best scientific analysis.

EPA has recently announced that it will conduct two more negotiated rulemakings.

Negotiated Approaches to Electric Utility Regulation

Of particular interest to electric utility companies are the negotiation projects now underway with support from the Edison Electric Institute. In three states—Colorado, New Mexico, and Massachusetts—groups of industry, environmental, consumer, public interest, and state and local government representatives are attempting to work out informal agreements that will then be subject to the usual review and comment process.

In Colorado, the subject of negotiation is a proposed "resource planning rule." The Public Service Commission has proposed to play a greater role in analyzing corporate decisions on the need for and the choice of electric generating systems. In New Mexico, the participants in an informal negotiation, which began in May 1985, are focusing on "rate shock moderation." The Public Service Commission proposed the formation of a task force to develop and recommend a rate moderation plan for customers served by the El Paso Electric Company; there is widespread concern that the "coming on line" of the Palo Verde nuclear power plant will necessitate dramatic rate increases. In Massachusetts, the participants are trying to reach agreement on the most appropriate methodology for demand forecasting and to develop a priority list of supply options for electric power in the Boston region. The Boston Edison Company believes it will face a shortage of power sometime in the next 15 years.

In each case, the negotiators have agreed to engage in a consensus building process. They have drafted their own ground rules and selected mediators to assist them in their talks. A group technical consultant has been employed in New Mexico, and a resource pool has been established in Massachusetts. All three negotiations should conclude by spring 1986.

These three projects were selected from more than 20 nominations submitted to EEI's Negotiation Task Force, which is made up of representatives from the Consumer Federation of America, the League of Women Voters, other

Stacy Pick/Uniphoto

"Is there anyone who can't live with the latest reformulation on this point?"

national public interest and consumer organizations, several state level regulatory and consumer advocates, and industry leaders. The solicitation and screening of project nominations were handled for the Task Force by the Public Disputes Program of the Program on Negotiation at Harvard Law School; the staff of the Public Disputes Program paid "site visits," interviewed interest group leaders, and planned organizational meetings. Negotiators in the projects chosen then proceeded with drafting ground rules to guide informal discussions, setting agendas, and forming fact-finding subcommittees. Although some groups were skeptical, participants representing a broad spectrum of interests in each state are actively involved in the negotiations. Whether they will be successful, of course, depends on a great many factors. Each project is being documented by the Harvard Public Disputes Program.

In addition to Colorado, New Mexico, and Massachusetts, other states are exploring the prospects of regulatory negotiations of their own. While none of the EEI-supported projects actually involves the negotiation of a formal request for a rate increase, one of the future cases may. A number of questions, however, should be answered first. Is it appropriate for regulatory commissions to participate in informal negotiations before or during formal dispositioning of rate requests? Is it likely that groups that have relied on the adversarial features of the intervenor process in the past will be able to negotiate consensually? Can the interests of the ratepaying public be protected during an informal negotiation even if that process is only a supplement to the traditional regulatory procedure? Will the parties to an informal process agree to be bound to a negotiated agreement, and, if they won't, is the negotiation process worth the trouble? And, finally, will consumer or citizen groups that participate in negotiations be able to function with what they believe to be industry's superior resources and clout?

With regard to the first question, the regulatory commission in the New Mexico project has designated staff to participate in the negotiations. The commissioners themselves are not participating directly since they will have to rule on whatever petitions are actually submitted. Nor has the commission agreed to bind itself beforehand to a negotiated outcome it may not like. Every participant, including the commission staff, has the option of walking away at any time or refusing to sign the final draft agreement.

A number of groups experienced in the adversarial intervenor process are quite skeptical about applying negotiation to regulation. They presume that no agreement can be reached when the interests of ratepayers and private utilities are in conflict. This same skepticism was expressed by environmentalists when EPA first proposed negotiated rulemaking. What they came to realize was that it was worth the effort to explore the opportunities that negotiation provided when the only alternative was win-it-all-or-lose-it-all-in-the-courts. The worst thing that can happen in negotiation is that differences are clarified and that the participants understand each other's concerns. In each of the states in which projects are underway, the most prominent intervenors in electric ratesetting cases have agreed to participate. Either they are tired of fighting or, perhaps, they recognize that there is little to lose by exploring a negotiated approach. If EPA's experience is illustrative, participants in the ratesetting negotiations will be surprised to learn that win-win agreements are possible—not because one group backs down, but because through collaboration they are likely to discover that they value different issues differently and that trading across these issues can produce "packages" that everyone finds attractive.

Attracting representation from traditional intervenors and others not previously active in utility cases has been an achievement. In New Mexico and Colorado, the attorney general's offices are directly representing the ratepaying public. Intervenor groups representing the poor and the disadvantaged can participate with assistance from resource pool funds to cover their expenses and equalize access to technical information. In New Mexico and Colorado, as many as 40 participants have been involved. Skilled mediators can make it possible for large groups of people to carry on a constructive conversation without resorting to the formalities of *Robert's Rules of Order* or voting. Indeed, voting is inappropriate in consensual decisionmaking situations (which these are). Usually, each portion of a facilitated negotiation continues until no one responds when the mediator asks, "Is there anyone who can't live with the latest reformulation on this point?"

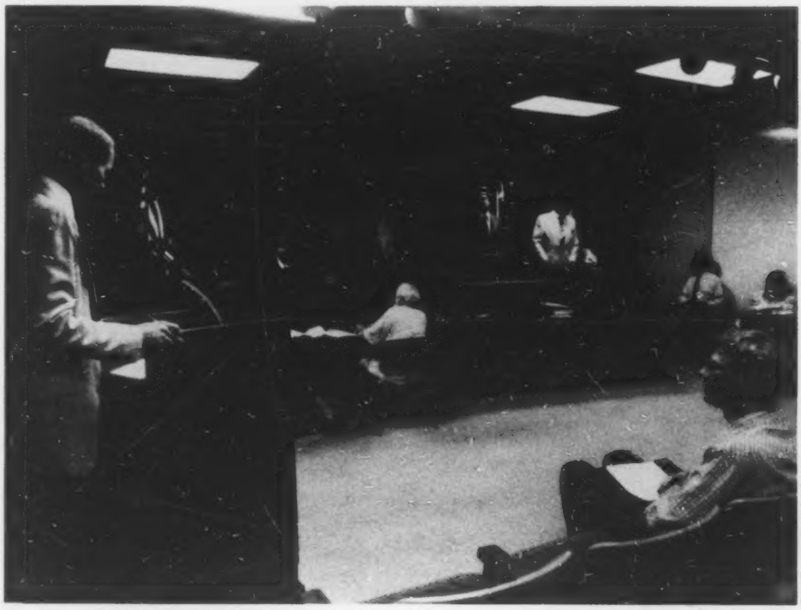
In a negotiated situation, all the parties are asked to "sign off" on a final written agreement. They also may be asked to initial a statement indicating that they will support the agreement when it comes before the commission or when written comments are sought. It is unlikely, though, that anyone can bind their entire organization or membership to an informal agreement.

In EPA's case, the parties were asked to circulate the final draft to their membership or management prior to initialling. This was an effective means of smoking out opposition that would surely appear later. Also, because the participants insisted that all stakeholding interests be represented by credible spokespersons, they believed that these signatures would carry sufficient weight to win support for the agreement from individuals who chose not to participate or who only heard about the rulemaking negotiation after the fact. They were correct.

The same should hold true in the EEI demonstration. The hope is that the regulatory commissions involved will use the result of the informal negotiations as the basis for stipulated agreements.

In EPA's demonstrations, the environmental community thought it was entering the negotiations at a disadvantage in representation and expertise. It was certainly outnumbered. National environmen-

All stakeholding interests must be on hand.



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tal organizations divided up responsibility for various issues among themselves. The Natural Resources Defense Council (NRDC), for example, had primary responsibility for matters pertaining to air pollution; the Sierra Club took the lead on pesticide issues. There were too few groups with too few resources for more than one group to develop in-depth knowledge on more than one or two issues. Industry, on the other hand, operated under no such constraints. In EPA's first demonstration, every truck engine manufacturer in America was represented. The numerical imbalance, however, was deceptive. The NRDC representative had a heavy impact on the negotiations. He was as technically adept as any of the industry participants, and his designation as the environmentalists' spokesperson gave him substantial clout.

Understanding Principled Negotiation

Negotiation is nothing new. We negotiate all the time. Typically, one side presents its position. The other side then does the same. Under some circumstances there may be sufficient motivation for both sides to reach a compromise. Whichever side is perceived as the most powerful tends to dictate the terms of the agreement while making the particulars appear to be in the best interest of the other to accept. Threats are common. Very seldom are the parties' underlying interests fully exposed.

Principled negotiation offers a more productive approach. Roger Fisher and William Ury in their best-selling book *Getting to Yes* (Boston: Houghton Mifflin Company, 1981), elaborate on this alternative theory of negotiation. Seven points of advice are offered:

1. *Develop Your Best Alternative to a Negotiated Agreement.* Each party should assess what it can realistically achieve on its own. Only by calculating one's best alternative to a negotiated agreement can one begin to evaluate the merits of a proposed settlement offer.

2. *Clarify Interests.* Each side should continue to ask questions and seek clarification until it clearly understands the other party's concerns.

3. *Create Options.* The parties should work to invent all the options they can. They should be creative and remain flexible. Ideally, the parties will set aside some time for "inventing not committing."

4. *Seek Legitimacy.* The parties should ask themselves what criteria for selecting among options will be viewed as most legitimate by the community-at-large.

5. *Communicate Effectively.* Talking is necessary to communicate interests; listening is equally important. Sometimes it takes a mediator to help the parties communicate effectively.

6. *Seek Realistic Commitments.* Seek to develop realistic, implementable agreements.

7. *Recognize the Value of the Relationship.* When negotiating, relationships can become entangled with the problem. The classic positional bargaining approach to negotiation places the substantive issue and the relationship in conflict. Principled negotiation seeks to separate the substantive problems from the interrelationships among the parties.

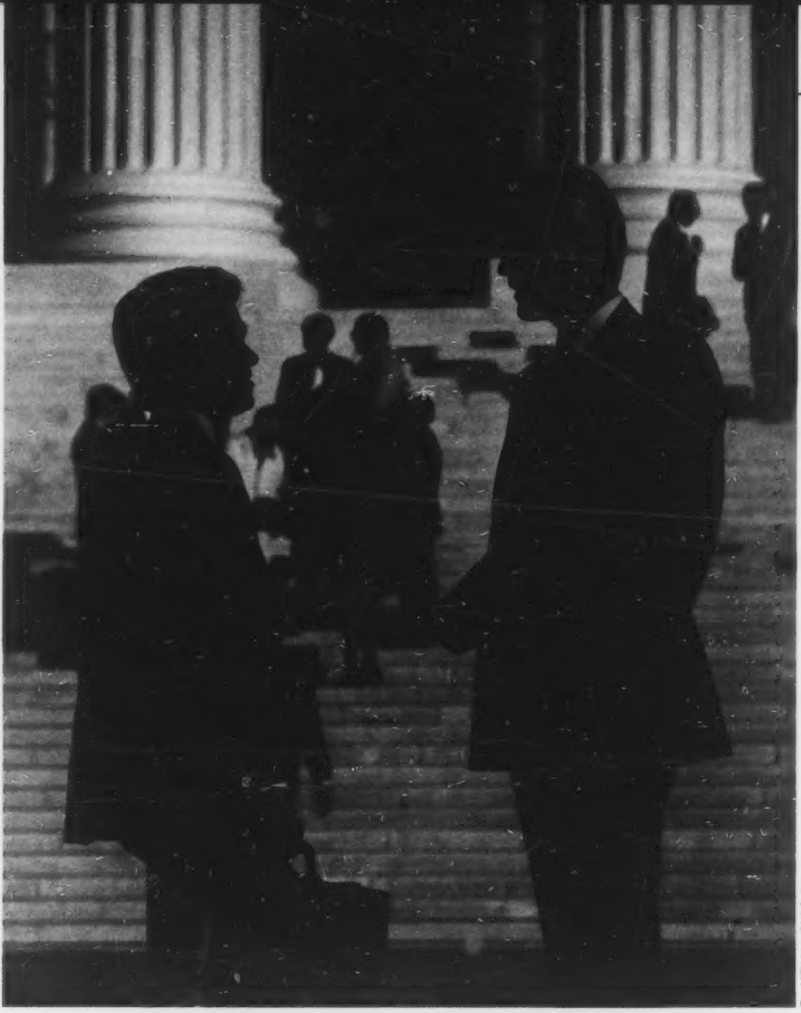
Elements of Assisted Negotiation or Mediation

In "assisted negotiation," parties use a "helper." The helper can be a convener, facilitator or mediator. We believe that the assistance of a non-partisan facilitator is critical in resolving multi-party public disputes. (*N.B.*, the demonstration projects supported by EEI involve from 15 to 40 parties.)

The facilitator-mediator plays many roles. During the pre-negotiation phase of a consensus building effort, the parties must develop ground rules by which to conduct their interactions. The mediator usually plays a key role in helping the parties draft ground rules. In addition, the mediator will encourage the parties to address several issues. Are all the essential interests represented? Will confidential or proprietary information be crucial to the discussions? If so, how should this information be protected? How will relations with the media be handled? Will meetings be open to the public? Is there agreement on the agenda? Is there agreement on the goals of the negotiation? If an agreement is reached, will a written document be produced? When principled negotiation is used, the mediator must see that all parties concur.

During the negotiation, the mediator ensures that all parties have an opportunity to air their views. When positions are expressed, the mediator will encourage the parties to shift attention to their underlying interests. The mediator aids in keeping the discussion focused and assists in forming subcommittees and clarifying their tasks.

Another significant role of the mediator is that of manager of the joint fact-finding process. When the parties have their own experts, the use of a shared group consultant has proven invaluable in reducing the level of disagreement between them and in correcting imbalances in technical knowledge. A neutral consultant selected by



Fred Kligman/Unphoto

An outside mediator can keep the negotiation process fair and efficient and can prevent deadlock.

the parties can provide a source of independent data as well as an educated interpretation of data supplied by others. It is not the role of the mediator to resolve matters of substance. Only the parties can do that. Therefore, while it is useful for the mediator to be familiar with the substantive issues under discussion, it is not essential that the mediator be considered a technical expert. It is crucial, though, that the mediator be acceptable to all the parties and that the mediator be highly skilled in the art of joint problem-solving and in facilitating communication.

Some Modest Prescriptions

The current regulatory process has a great many flaws. What we need are demonstrations such as the three that the Edison Electric Institute and its national consumer group partners are now sponsoring. The results of these and related efforts will shed light on the merits of the negotiated approach. For those considering participating in such demonstrations, there are five important things to remember:

- Unless all relevant stakeholders agree to participate, negotiations are not likely to produce credible results. This means that a great deal of emphasis must be placed on actively reaching out to potentially affected groups.
- Negotiated outcomes that emphasize political acceptability at the expense of the accuracy and wisdom of the underlying technical assumptions are sure to produce unwise results. Indeed, expedient agreements can have dire long-term consequences. This means that a great deal of emphasis should be placed on joint fact-finding.
- Without an "outside" mediator to take responsibility for the fairness and efficiency of the negotiation process, informal negotiations are likely to deadlock in much the same way as adversarial processes. This means that a great deal of attention should be paid to the selection of credible and able "helpers."
- Negotiated approaches cannot be used to pre-empt mandated review and comment procedures or to short-circuit the option of appellate review. If the negotiations are successful, these required steps should not add to the time or cost involved. If they are not successful, these requirements provide important safeguards.
- The product of an informal negotiation should be a draft agreement completed in time for all the participants to check back with their constituents or superiors before signing off on the final version. Participants should not be expected to formally bind their members; the search for such a commitment is fruitless.

Negotiation may not always be appropriate. When constitutional rights are at stake, for instance, it may be preferable to seek definitive court rulings. Nevertheless, most regulatory conflicts tend to focus on the distributions of gains and losses. Distributional questions can be handled better through non-adversarial processes. It may take several years to discover when and how to match negotiated approaches with specific administrative conflicts. Yet, if wiser and more efficient agency decision-making is the goal, it is important to make the effort. ▰

Leslie Braunstein

Stockpiling Power: Can We Do It?

Lead-acid and zinc-chloride batteries and compressed air energy storage could be marketable soon.

If Southern California Edison customers want to heat their hot tubs late at night, they have no trouble getting the power. With all the electricity it buys from third-party producers that use wind, solar, and cogeneration, the Southern California Edison Company is blessed with "an overabundance of resources," according to senior vice president Larry Papay.

"That's why we're looking into electric energy storage," he says. "We want to be able to absorb the energy that otherwise would be wasted. The other choice is to turn off lower-cost sources of power, and by law we cannot turn off the cogenerators. We think that advanced storage systems could help us solve this minimum load problem."

Comments Fred Denny, director of engineering at Edison Electric Institute (EEI), "Advances in electric energy storage technology will make it practical to more effectively use some of the alternative generation technologies such as solar and wind power. Energy storage also can be beneficial in conventional systems involving hydro, fossil, and nuclear power plants. New technologies can make it possible to deal with unfavorable load factors, they can help companies take advantage of low-cost resources, and they can reduce the costs and wear resulting from frequent shut-downs and start-ups of large units."

Effective management of existing resources will be an important aspect of financial success for electric utilities through the 1990s. According to EEI vice president Richard Braatz, "we are now in a period of trying to regain financial flexibility, and that means reducing capital expenditures while improving management of resources."

The Front-Runners

As utilities begin looking seriously at electric energy storage, they are likely to focus on two advanced technologies that could see significant deployment in the 1990s—advanced batteries and compressed air energy storage.

"Batteries are a well-established technology," says Dr. Peter Blair, manager of the Energy and Materials Program at the U.S. Congress' Office of Technology Assessment (OTA). "But only recently have advances in chemistry and materials made it possible to construct large-scale systems with sufficiently long lifetimes and low capital costs to attract utility interest."

Of the many types of advanced battery systems under development, the one closest to commercialization is the lead-acid type. Since 1983, a 500-kilowatt state-of-the-art lead-acid battery system produced by GNB Batteries has been under test at the Battery Energy Storage Test (BEST) facility in Hillsborough Township, New Jersey. The BEST facility is operated by Public Service Electric and Gas Company for the Department of Energy (DOE) and the Electric Power Research Institute (EPRI). Because these batteries have a one-hour discharge cycle, they form a 500-kilowatt-hour system. Complete system tests have been going on since the summer of 1985, when power conditioning and control equipment was added. The program is planned to continue through March 1986.

"This system is being tested mainly for customer-side-of-the-meter applications," said James Birk, director of EPRI's Advanced Conversion and Storage Department, meaning that small battery energy storage systems would be purchased by a utility's business, industrial or residential customers. He added that a lead-acid battery system designed to provide emergency or back-up power at utility substations will be tested beginning in March 1986.

For the past few years, both EPRI and OTA have considered the zinc-chloride battery to be the "second runner-up" in the race to advanced battery commercialization. From September 1983 until January 1984, the BEST facility tested a zinc-chloride battery system produced by Energy Development Associates (EDA), a subsidiary of Gulf & Western. The system consisted of ten 10-kilowatt (50-kilowatt-hour) modules with a five-hour discharge cycle, for a total system capacity of 100 kilowatts (500 kilowatt-hours).

"This system worked pretty well for a first of its kind," says EPRI's Birk. "The problems that it had, such as shorting switches, were repairable by typical utility maintenance engineers."

Despite the relative success of the test, plans for the zinc-chloride bat-

Leslie Braunstein is a writer specializing in economics, energy, and technology.

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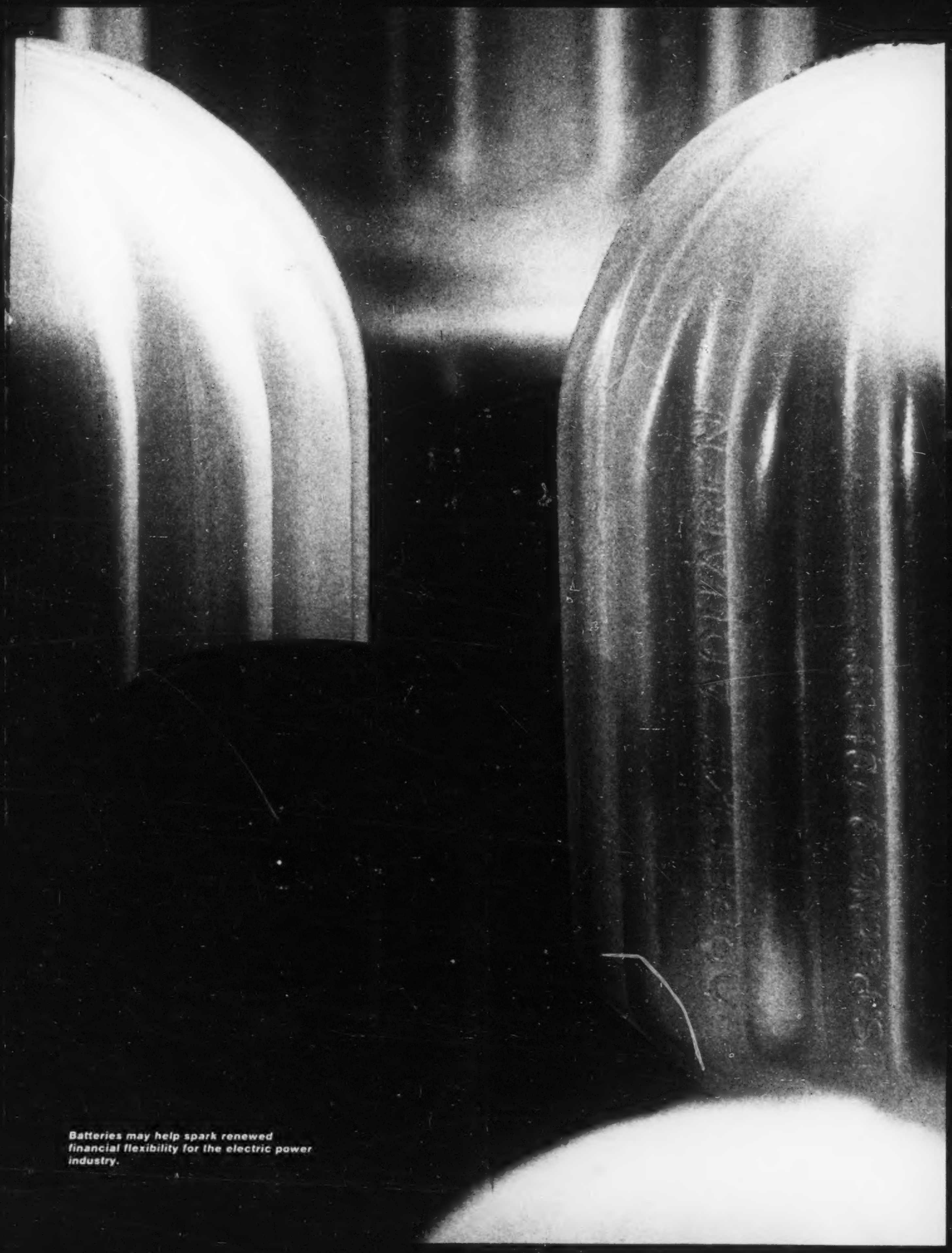


Batteries may help spark renewed financial flexibility for the electric power industry.

tery development program were halted during the summer of 1985 when Gulf & Western put EDA up for sale.

"If or when EDA is sold," Birk notes, "we would still be open to discussion regarding our support of the program. They currently envision a two-year effort to build a 2-megawatt battery system, which would either go to a utility or to BEST for test operation by the end of 1987."

Another note of optimism regarding the zinc-chloride battery comes from OTA's Blair. "Technologically speaking, I think that zinc-chloride is one of the more attractive options that we found in our survey," he said. "In the short time frame, however, the lead-acid battery appears to be the front-runner."

Getting the Lead Out to Market

EPRI is taking the next step in the commercialization of advanced lead-acid batteries for utility load management. "We want to encourage the commercialization of these batteries and to advance the development of power conditioning and control equipment," says Birk. Toward these goals, EPRI is soliciting expressions of interest from utilities to build and operate at least one 10-megawatt (50-megawatt-hour) grid-connected battery energy storage system. To date, 15 utilities have responded.

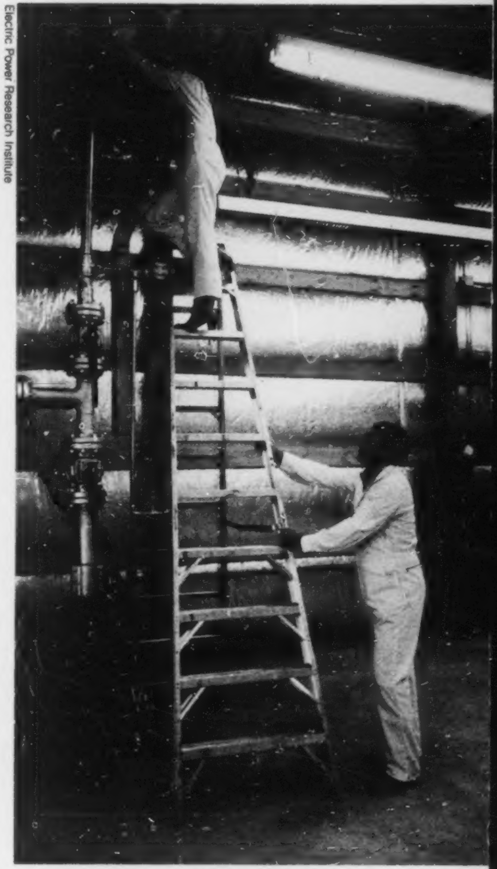
"Under this program," explains Birk, "EPRI would provide the power conditioning and control equipment, while the utility would build and operate the rest of the system. As an added incentive, the lead producers will provide a long-term loan of the 2,500 tons of lead that will be required for the system. We're helping each of the 15 utilities conduct cost studies and benefits assessments prior to their making final decisions by November 1986. After that, we'll make the final selection of participants."

Southern California Edison is one utility that has submitted proposals to EPRI to serve as a host for the project. Even if the company is not selected, it may go ahead with a similar system on its own. The company plans to install a 10-megawatt battery energy storage system at a substation near a load center. "We are aiming for on-line test operation by 1990 at the latest and then to declare firm operation in the early 1990s," says Papay, adding that EPRI support may speed the project's completion.

Houston Lighting and Power Company also has submitted a proposal to EPRI to host an installation. "If we are selected, we'll go with their technology," says Bobby Burgess, general manager for system engineering, noting that his company does not plan to proceed without EPRI support. Although cogenerators offer the Houston utility more power than it can use, the problem is currently solved by wheeling the excess to Texas Utilities Company in the Dallas/Fort Worth area. "The nature of cogeneration in the Houston area is base-load, with industrial plants running around the clock," notes OTA's Blair, "while in California, the more diverse types of power production weigh more in favor of electric energy storage."

Air and Water from the Ground Up

In addition to its battery system, Southern California Edison is planning a 50-megawatt compressed air energy storage (CAES) facility to begin operating early in the next decade. The CAES technology, which has been demonstrated successfully in Europe, uses off-peak power to pressurize air in an underground storage cavern. The air is later released during peak-load hours to help drive a gas turbine. The California utility is evaluating three underground sites as potential locations for its advanced facility. Two of the sites contain underground caverns that have been used for natural gas storage; the other is an underground salt dome.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At an aquifer compressed-air energy storage field testing project, workers check the injection-withdrawal well.

"The timing of the CAES project depends on EPRI participation," says Papay. "With EPRI funding, we anticipate full operation by 1990. Without it, we would have to re-evaluate costs and benefits."

Southern California Edison is one of four utilities—the others being Alabama Electric Cooperative, Cleveland Electric Illuminating Company, and the Sacramento Municipal Utility District—that are seriously considering near-term compressed air energy storage deployment, according to EPRI's Birk. "They've all done site-specific engineering studies, and the technology looks good for them."

Birk points out that EPRI probably will provide some financial assistance with the first utility-based CAES. "This technology is very nearly commercial; there are no insurmountable technical issues to resolve," he said. "The costs may be higher, however, for a plant that's the first of its kind, and that's where we would participate."

While the two advanced electric energy storage projects at Southern California Edison may depend partially on EPRI support, the company is independently deploying a proven technology: pumped hydro storage. This technology involves using off-peak power to pump water from a lower reservoir to a higher one and then using the stored water to produce hydroelectric power during peak hours. "We're installing 200 megawatts of pump-back capability at the Balsam Meadow plant in the Sierra Nevada Mountains," says Papay. "It should come on-line in 1988."

Although there are currently numerous pumped hydro installations in the United States, few new installations are expected through the end of the century, according to OTA. "It has become difficult to site these plants if they involve a large above-ground reservoir," says Blair, "and if the water is stored underground, the plants are eco-

Compressor Systems Inc.

Electric Power Research Institute

A compressor pumps air through a well to an aquifer. In addition to batteries, compressed-air energy storage technology is a front-runner in the race for commercialization.

nomic only in very large units." Other electric energy storage technologies, he points out, cannot compete economically in the near term with CAES and the two leading battery types.

Lead-Acid—Simple and Quick

Batteries date back more than 2,000 years; the Parthians may have used batteries for gold-plating jewelry before the birth of Christ. In 1792, Alessandro Volta observed that an electric current could be produced by placing two dissimilar metals in contact with a moist substance. The first practical battery, which used lead as the metal and sulfuric acid as the electrolyte, was invented by Gaston Plante in 1859. Today the lead-acid battery remains the most widely used type of rechargeable battery.

This is how a lead-acid battery operates: In its fully charged state —in which it stores its maximum amount of energy—it consists of a negative lead electrode and a positive lead dioxide electrode in an electrolyte of sulfuric acid. As the battery discharges—that is, releases its energy—a chemical reaction takes place, resulting in a flow of electrons from the negative to the positive electrode. When the battery is fully discharged, the electrodes consist of lead sulfate and the electrolyte is water. Electricity going into the battery recharges it, essentially reversing the discharge process. The time it takes a rechargeable battery to release all its energy and then "stock up" again is a single charge-discharge cycle.

Lead-acid batteries are now used primarily for starting automotive engines, powering moving vehicles such as fork-lifts and golf carts, and providing stationary power in such facilities as railway switches and remote communications stations. These batteries are being further developed and improved for use in electric cars, utility load-leveling, and storage systems for photovoltaic and wind power systems.

Because they have been produced and used for decades in the United States, lead-acid batteries are prime candidates for early commercialization in new applications such as utility load-leveling both at utility and customer sites. Current research and development efforts are focused on increasing the lifetime and reducing the capital cost of batteries for such applications.

At the moment, lead-acid batteries for load-leveling can be purchased with a guaranteed lifetime of 1,500 charge-discharge cycles. Over the next few years, it is expected that the lifetime of such batteries can be extended to a maximum of 4,000 cycles. A lifetime of 2,000-to-4,000 cycles would mean replacing battery stacks every eight-to-16 years, although about half of the parts and materials could be re-used.

Lead-acid and more advanced battery types offer a number of advantages to utilities. Their main advantage is their flexibility. Batteries are modular: utilities can purchase units as needed and can continue to add capacity in small increments. This factor, combined with very short construction lead-times, means that battery installations pose little financial and regulatory risk. In addition, they have minimal environmental impact: virtually no emissions and very little noise. For this reason, they can

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Pumped hydro storage is already in use by some utilities, but siting problems may limit its spread.

be built close to load centers, thereby minimizing transmission costs. Furthermore, batteries' ability to reach full power in seconds helps optimize utility operations.

With such advantages, why haven't batteries been used widely by utilities to date? The answer lies primarily with the problem of capital cost (Table 1). Depending upon the price of lead and the volume of production, the projected capital cost of lead-acid batteries in the 1990s is $600-to-$800 per kilowatt (in today's dollars). This figure is close to the capital cost of $500 per kilowatt generally agreed to be economic. Unlike many power generating technologies, however, battery storage systems generally do not offer economies of scale.

A typical utility battery installation in the 1990s is expected to have a peak power output of 20 megawatts. Such a plant would consist of 10-to-50 factory-built modules, along with control and power conditioning equipment, housed in a protective building about the size of a house. Figure 1 shows a generic design for this type of battery system. It would require only a small fraction of an acre of land and minimal water.

Plans to demonstrate commercial-scale battery systems are proceeding rapidly in Europe and Japan. Japanese National Railways already has installed a lead-acid battery system. In Germany, construction of a 17-megawatt battery facility began in West Berlin in

Table 1

Cost and Performance of Battery Plants

1985 Technology Status	**Lead-Acid**	**Zinc-Chloride**
Level of Technology Development	Small-scale test	Small-scale test
Installed Capacity	0.5 MW	None
Reference System: General Characteristics		
Reference Year	1995	
Plant Size	20 MW	
Deployment Level Scenario	0-600 MW	0-2,800 MW
Lead-Time	2 years	
Land Required	0.2-0.3 acres	
Water Required (gallons/day)	200-300	11,000
Reference System: Performance Parameters		
Availability	90 percent	
Duty Cycle	Peaking	
Lifetime		
Stacks	2,000-4,000 cycles	2,000-5,000 cycles
Balance of Plant	30 years	30 years
Plant Efficiency	70-75 percent	60-70 percent
Discharge/Charge	5 hours/6.7-7.0 hours	5 hours/7.0-8.3 hours
Reference System: Costs		
Capital Costs	$600-$800/KW	$500-$3,000/KW
Operating & Maintenance Costs		
Annual	1-4 mills/KWh	1-4 mills/KWh
Replacement	5-16 mills/KWh	2-7 mills/KWh
Total	6-20 mills/KWh	3-11 mills/KWh
Fuel Costs	27-50 mills/KWh	29-58 mills/KWh

Source: Adapted from *New Electric Power Technologies: Problems and Prospects for the 1990s* (Washington, D.C.: U.S. Congress, Office of Technology Assessment, OTA-E-246, July 1985), p. 316.

early 1985. The system's predecessor, a prototype facility, was the world's first large, modern, grid-connected utility battery system.

In the United States, prospects for commercial utility use of lead-acid batteries look bright primarily due to the recent drop in lead prices, following government-mandated removal of lead from paint and gasoline. Nonetheless, economic uncertainties remain. Potential buyers, including electric utilities, are concerned that oil and gas prices may continue to drop, making even the least expensive battery systems uneconomic compared with conventional technologies for meeting peak capacity requirements.

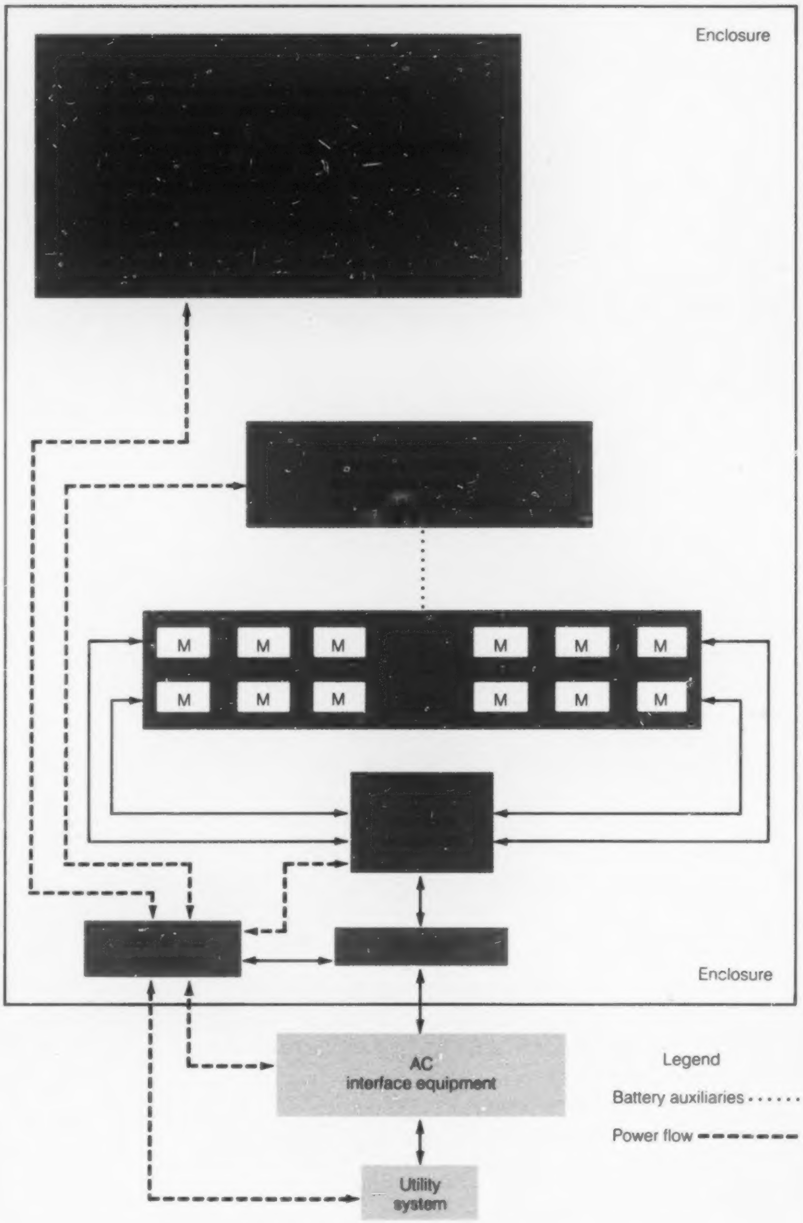
Zinc-Chloride Batteries—Cheaper and Longer-Lasting

Development of the zinc-chloride battery concept began in the 1970s and continued because it offered the promise of lower cost and longer lifetime than the lead-acid battery. Commercialization of lead-acid battery storage systems could enhance interest in the zinc-chloride concept.

The zinc-chloride battery system—often considered to operate more like a chemical plant than a battery—contains a battery stack and a nearby sump. In the discharged state, the electrolyte in the battery stack is a zinc-chloride solution, while the sump contains water. During the charge phase, chlorine ions from the electrolyte combine at the positive electrode to form chlorine gas and release electrons, while zinc is removed from the electrolyte and deposited on the negative electrode. The chlorine gas is pumped into the sump, which has been chilled to below 10 degrees C. In the sump, the gas reacts with the cold water to form a

Figure 1

Generic Battery System



Source: Peter Lewis, Public Service Electric and Gas Company (Newark, N.J.), "Elements of Load-Leveling Battery Design for System Planning," presented at the International Symposium and Workshop on Dynamic Benefits of Energy Storage Plan Operation.

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The status of research and development projects shows up on computer screens at the BEST facility in New Jersey.

chlorine hydrate slush.

During the discharge cycle, the chlorine hydrate is heated to release chlorine gas, which is pumped back into the battery stack. The gas combines with electrons from the positive electrodes to form chlorine ions. At the negative electrode, zinc atoms release electrons before entering the electrolyte as zinc ions.

This type of system, with its pumps and refrigeration equipment, is more complex than the lead-acid battery system. Nonetheless, zinc-chloride promises to be less expensive per kilowatt than the lead-acid system because its materials are relatively inexpensive. At production levels of about 700 megawatts per year, zinc-chloride batteries could be sold at less than $500 per kilowatt, according to recent estimates. Since there is not currently a market for such batteries, however, the earliest commercial units could cost as much as $3,000 per kilowatt. Zinc-chloride batteries may eventually surpass their lead-acid counterparts in lifetime; they may last up to 5,000 cycles. Small test units have run up to 2,500 cycles, although the large module tested at the BEST facility ran less than 100 cycles.

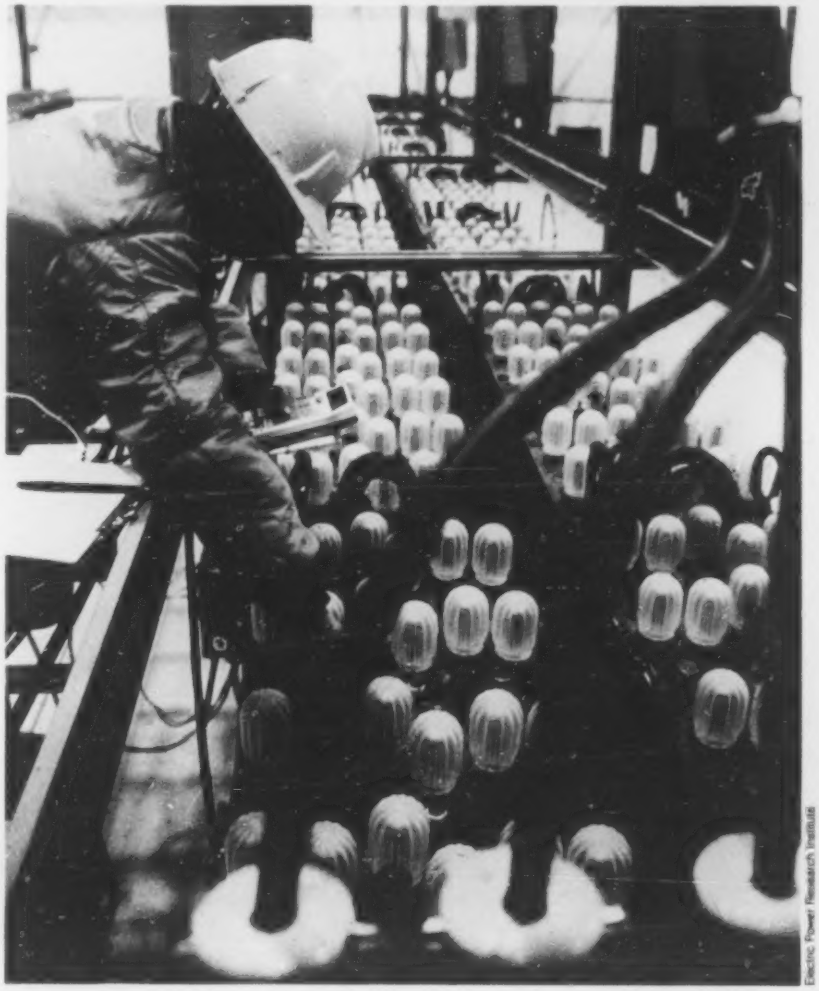
In addition to projected lower cost and longer lifetime, zinc-chloride batteries should offer another major advantage over lead-acid batteries: greater flexibility. Because the zinc and chlorine are separated in stacks and sumps, the reaction rate can be controlled by modifying the speed at which the pumps allow the reactants to combine.

The presence of chlorine in the system, however, may cause delays in licensing the earliest zinc-chloride systems. The chlorine is stored in solid form, minimizing the danger of a release of large quantities of chlorine gas. Nonetheless, utilities using zinc-chloride battery storage systems will have to implement safety procedures similar to those used by industries that use chlorine gas.

By mid-1985, Energy Development Associates had offered to produce a commercial-scale zinc-chloride battery module for load leveling, called FLEXPOWER, rated at 2 megawatts (8 megawatt-hours). It had built a one-sixteenth scale 125-kilowatt prototype of this system, and tested it for 30 cycles at its plant in Greensboro, North Carolina.

This type of new system may face

The recent drop in lead prices may throw open more quickly than expected the lead-acid battery as a practical option for load leveling.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a difficult dilemma, however, according to OTA. Utilities will not want to invest in it until its cost is reduced substantially, and vendors will be unable to bring costs down until they can produce for a mass market. For this reason, commercialization is likely to rely heavily on EPRI support of increasingly larger demonstration units.

Next in Line

Behind lead-acid and zinc-chloride batteries on the road to commercialization are a number of more advanced battery types in various stages of development. Research at private companies and federal government laboratories is progressing with the financial support of EPRI and DOE. "DOE's role is to support generic research," says Kenneth Klein, director of DOE's Office of Energy Storage and Distribution. Although some batteries are being developed primarily for certain applications—for instance, high-temperature batteries for electric vehicles—the applications may be interchangeable in the future.

Although it is difficult to predict the concepts that will prove technological "winners," a good measure of success for a battery under development is its selection for testing at the BEST facility. Currently, BEST tests beginning in the late 1980s are planned for three types of advanced batteries: sodium-sulfur, zinc-bromine, and lithium-metal sulfide.

EPRI considers the sodium-sulfur battery the most popular of the advanced battery concepts. It is known as a "beta system" because it uses beta alumina, a lightweight and inexpensive solid ceramic material, as its electrolyte. A high operating temperature—about 600 degrees F—keeps the electrolyte conductive and the materials in the electrodes in a molten state.

Under a recently completed DOE contract with Ford Aerospace and Communications Corporation, a 75-kilowatt-hour (approximately 15-kilowatt) stationary sodium-sulfur battery was operated successfully for 675 cycles over 32 months. DOE recently awarded a follow-up multi-million-dollar contract to Chloride Silent Power Limited of England to continue developing this system and to produce a 50-kilowatt-hour (10-kilowatt) module for stationary energy storage. Building on this concept and its unique design, the British company and EPRI plan to develop a 500-kilowatt-hour (100-kilowatt) stationary energy storage battery to be tested at the BEST site by 1990.

"DOE and EPRI are participating in a four-year $30 million program to develop both the sodium-sulfur and zinc-bromine battery," notes Birk. "DOE funds the research and development, while EPRI supports the design, engineering, and fabrication of the modules to be tested at the BEST facility."

While such research and development continue in the United States and abroad, engineers at DOE's Argonne National Laboratory in Argonne, Illinois, are work-

"Batteries are a well-established technology. But only recently have advances in chemistry and materials made it possible to construct large-scale systems with sufficiently long lifetimes and low capital costs to attract utility interest."

ing on a glass electrolyte for the sodium-sulfur battery that has been proven ten times more conductive than the ceramic electrolytes now envisioned for use in these batteries. A battery using this new electrolyte could store five times as much energy as a conventional lead-acid battery of the same weight, say the Argonne researchers.

Zinc-bromine battery development has been taken a long way through the efforts of Exxon Research and Engineering Company. Under DOE contracts, Exxon successfully designed and operated a zinc-bromine battery system for an advanced electric vehicle. DOE's Sandia National Laboratory, Albuquerque, New Mexico, recently awarded a new contract to the Connecticut-based Energy Research Corporation under the DOE-EPRI program mentioned above. It calls for development of a 50-kilowatt-hour (10-kilowatt) zinc-bromine battery module, to be followed by construction of a 500-kilowatt-hour (100-kilowatt) system to be tested at the BEST site beginning in 1989.

Like the sodium-sulfur cell, the lithium-metal sulfide battery promises more energy per unit of weight than conventional batteries. Argonne National Laboratory has been working with Gould, Inc., and other manufacturers since 1973 to develop such lightweight battery systems for electric vehicles. "Our new lithium-iron monosulfide batteries are rapidly approaching the performance required by a practical electric van," says Argonne's Al Chilenskas.

The lithium-iron monosulfide battery uses a lithium-aluminum alloy at the negative electrode and iron sulfide at the positive electrode. The electrolyte is a molten salt of lithium and potassium chloride. The battery operates at 800-to-930 degrees F. Although it is being developed primarily for electric vans, which tend to be parked long enough between trips to permit recharging, such a battery also could be useful for electric energy storage at utility sites or in various buildings.

Although it is not currently scheduled for testing at the BEST facility, researchers single out another type of advanced battery—the hydrogen/nickel oxide battery—as a promising concept. Nicholas Magnani, manager of Sandia's Power Sources Department, points out that an aerospace version of this battery has operated for more than 7,000 cycles "without maintenance or other human intervention. Unfortunately," he adds, "it is very expensive."

The aerospace battery has been produced at a cost of about $25,000 per kilowatt-hour. Two Sandia contractors—COMSAT Laboratories, Inc., and Johnson Controls, Inc.—have produced designs that are expected to be about one-twelfth as expensive as the original aerospace system. If the system cost can be reduced to $400 per kilowatt-hour, it could be used to economically store excess and off-peak electric power produced by wind turbines and photovoltaic systems.

"This system is attracting a lot of attention because it's 'the dream,' " comments Birk. "It offers long life and tolerates a lot of abuse, but it will be a great challenge to get its cost down."

Compressed Air

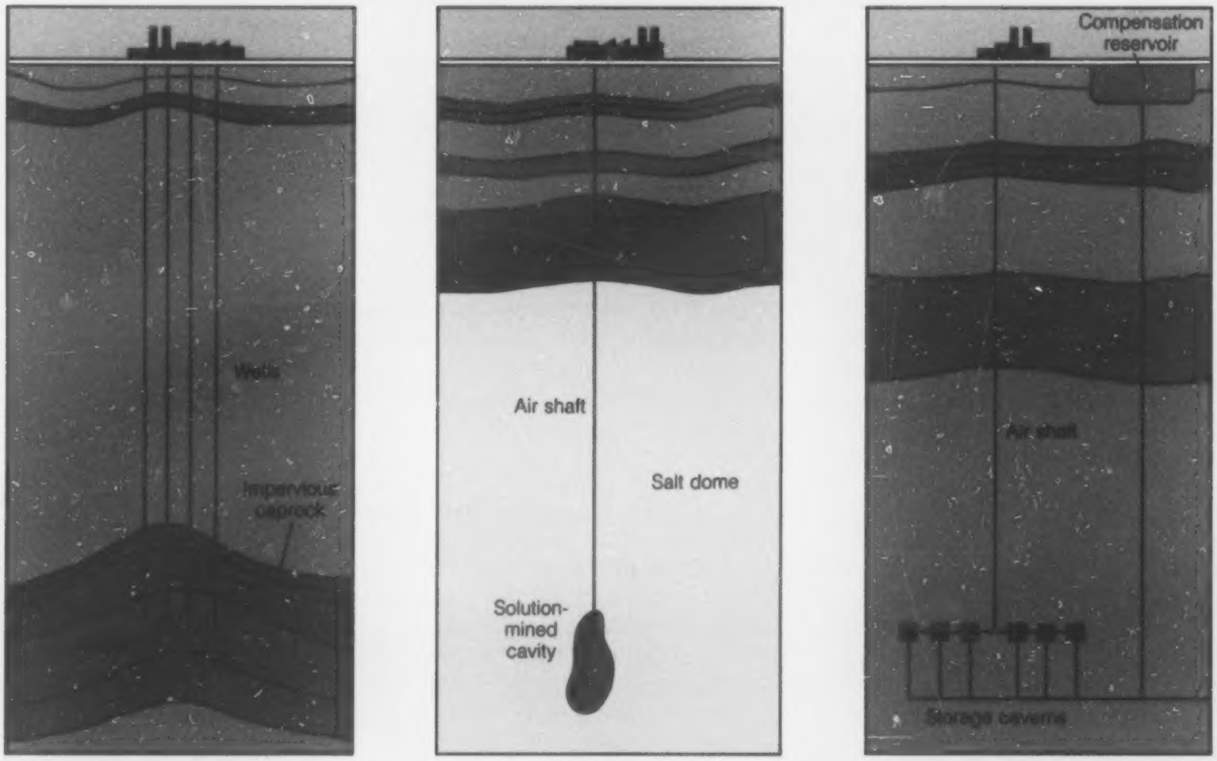
Compressed air energy storage uses off-peak electric power to compress air, which is stored in an underground cavern. When the stored energy is needed to meet peak power demand, the compressed air is released to a combustion turbine, where it is mixed with natural gas or oil before being burned to power a generator. In a conventional natural gas turbine, two-thirds of the energy from gas combustion is drawn off to drive the turbine's own compressor, leaving only one-third of the turbine's total power to produce electricity. By using compressed air stored in a CAES plant, the gas turbine can operate three times more efficiently. The system's overall efficiency is further improved when the gas discharged from the turbine passes through a recuperator, where some of its heat is released to warm the incoming air from the storage cavern.

When put into operation in the 1990s, CAES plants are expected to have an economic advantage over advanced battery storage systems. They are likely to be less expensive than batteries on a dollar per kilowatt-hour basis when discharge times of more than five hours are required. Since they are not modular, however, CAES plants will carry significantly more financial risk than battery energy storage facilities.

About 75 percent of the United States has geologic features suitable for CAES plants: salt reservoirs, hard rock reservoirs or aquifers (see Figure 2). Salt caverns, found mostly in Louisiana and east

Figure 2

Geological Formations for CAES Caverns



Aquifers
In an aquifer system, numerous wells are sunk through an impervious caprock into porous material such as sand, sandstone or gravel. The force of the surrounding water confines the compressed air and maintains it as a constant pressure as it is injected and withdrawn from the system.

Salt Caverns
Salt caverns are mined by a technique called solution-mining. A narrow well is drilled into a salt dome and fresh water is continuously pumped in to dissolve the salt while the resultant brine is pumped out. The process is continued until the desired storage volume is reached. The necessary volume is larger than that needed in a hard rock or aquifer system because, without water present, the pressure of the compressed air drops as it is withdrawn from the cavern.

Hard Rock Caverns
Hard rock caverns are mined with standard excavation techniques. A compensation reservoir on the surface maintains a constant pressure in the cavern as the compressed air is injected and withdrawn. This minimizes the volume of rock it is necessary to excavate.

Source: Adapted from "Eighty Atmospheres in Reserve," *ERPI Journal*, April 1979.

Texas, can be "solution-mined" with water and left virtually airtight. Rock caverns, on the other hand, must be excavated with underground mining equipment. Such systems, however, can include above-ground "compensating reservoirs" that maintain constant pressure in the caverns as they discharge. With a compensating reservoir, the underground cavern selected for a CAES system can be smaller.

Aquifers are found in much of the Midwest and parts of the Northeast. They do not have to be excavated at all. Instead, compressed air is pumped into the reservoir during off-peak hours, forcing the water downward. As air is withdrawn from the reservoir, the water returns to its original place. Because they need no excavation, aquifer CAES plants are expected to be the least expensive of the three geological types. In addition, they allow more flexible operation because their reservoir volumes can fluctuate.

CAES plants being considered for the 1990s fall into two size categories: "maxi-CAES" plants of 220 megawatts and "mini-CAES" of 50 megawatts. The machinery cost is expected to be greater for the larger plant: more than $500 per kilowatt for the maxi-CAES *vs.* about $390 per kilowatt for mini-CAES, according to OTA. Once in operation, however, the dollar-per-kilowatt cost for the larger plant is expected to be less than that of the smaller plant.

Regulatory delays may impede the commercialization of CAES plants. The major licensing problem will involve the disposal of rock or brine from the excavation of salt domes or rock caverns. Furthermore, although CAES plants ultimately save oil and gas, the use of these fuels means that these facilities must be exempted from the Powerplant and Industrial Fuel Use Act of 1978.

"If one utility steps forward with a CAES system, others are likely to follow," notes Birk. "We have only to look at the success of the one that has been operating in Huntdorf, West Germany, for seven years. It has had well over 90 percent availability—and that's astonishing for any power plant, let alone a new one. CAES systems are also under construction in Italy and in the U.S.S.R., and we expect that it won't be long before one is built here in the United States."

The Outlook

DOE and EPRI studies have projected that energy storage systems could provide up to five percent of the nation's total electricity demand—and up to 15 percent of peak demand—by the end of this century. The rate at which commercialization will progress during the 1990s, however, is uncertain.

Federal support of electric energy storage research and development has declined. DOE's electrochemical storage program budget has been cut to $14.7 million in fiscal 1986, from $16.8 million the previous fiscal year. That leaves EPRI and electric utilities with a larger responsibility.

But with many power companies already planning near-term storage systems, it seems sure that electric energy storage technology will soon play an important role in utility engineering and operations. ■

As We Go to Press . . .

As we go to press, we have learned that DOE and EPRI plan to terminate funding of the BEST facility by the end of May 1986. EPRI may continue to fund low-level activity there, such as training programs in battery operation and maintenance. Future EPRI-funded battery system tests may take place at individual utilities.

We also have learned that EPRI recently selected Southern California Edison to test the 10-megawatt lead-acid battery system mentioned in this article.

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Sherwood H. Smith, Jr.

The Power of Quality

"Ignoring the quality issue is tantamount to corporate suicide."

As our industry approaches the year 2000, it may face changes as profound and far-reaching as any since the Federal Power Act and Holding Company Act earlier in the century. The exact nature of those changes, of course, remains uncertain. What seems certain, however, is that the quality of service to customers and quality of work by employees will determine, in large measure, which electric utilities prosper and which do not.

American industry in general has gained a renewed awareness of the importance of quality in a global marketplace. Whether it is the mature steel, auto, and textile industries or the fast-growing electronics industry, quality has emerged as a focus of activities to strengthen economic position.

John A. Young, president and chief executive officer of Hewlett-Packard, states the issue succinctly: "In today's competitive environment, ignoring the quality issue is tantamount to corporate suicide."[1] F. James McDonald, president of General Motors Corporation, says it just as bluntly: "If quality is not the number one operating priority at GM, there may come a time when there is no GM."[2]

These are the sentiments of executives in industries that face increasing competition from abroad. They clearly understand that the challenge is to produce high-quality products.

American industry is rising to the challenge. This past October, our nation observed its first National Quality Month as part of a five-year plan to promote "Quality First" in American products and services. The first chairman of this national campaign, James E. Olson, president of AT&T, said; "Quality is the issue for American business in the 1980s. Clearly we must demonstrate more visibly, by word and deed, that American business cares about quality, delivers quality—and is working hard to improve quality."[3]

The selection of a service industry executive to head this national campaign is a sign that quality is no longer limited to manufacturing. In the past few years, many banks, insurance companies, accounting firms, and utilities have undertaken extensive programs to improve the quality of their services.

Quality for Electric Utilities

The competitive spur to quality in the newly deregulated service industries, such as telecommunications, airlines, and banking, is obvious. Perhaps less obvious but no less real should be an increased emphasis on quality in the electric utility industry.

Over the past 15 years, our industry has changed from a stable, predictable, declining-cost industry to one of volatility, uncertainty, and increasing cost. Far from being a temporary disruption on an otherwise smooth course, the energy crises of the 1970s signaled fundamental change.

Externally, we are seeing increased competition from a variety of sources, old and new: from gas in heating and industrial process applications, from oil since its price decline, and from a variety of small alternative energy suppliers. Encouraged by federal legislation and tax incentives, developers of cogeneration, small hydro, and solar projects, for example, present a modest but growing challenge to electric utilities' traditional markets.

In addition to competition, electric utilities face growing expectations from customers regarding the quality of service. Utilities have long known that their customers expect a high quality of service and that they are quick to complain about power outages and other "defects," real or perceived. Unlike almost any other business, an electric utility's reputation for quality is on the line every hour of every day.

Despite the longstanding commitment to service and the remarkable record of achievement, electric utilities today face new and higher customer expectations. As we have been able to achieve higher and higher continuity of service, for example, customers' standards have increased. In addition, as utility rates have had to be raised, customers have become less tolerant of service problems, however minor or brief.

Another driving force behind utility customers' higher expectations is the advent and widespread use of computers and other sensitive electronic equipment. A recent trade journal article entitled "The Emerging Problem of Electric Power Quality" details the technical concerns and economic implications of so-called "dirty power" in today's electronic society.[4]

The scrutiny electric utilities have always operated under has intensified as rates have become higher, power production technol-

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A 20-year veteran of the electric utility industry, Sherwood H. Smith, Jr., is chairman and president of Carolina Power & Light Company and is currently chairman of the Edison Electric Institute.

Charles Feil/Uniphoto

Re-dedication to excellence from the inside out can assure utilities' profitability and public confidence.

ogies more controversial, and society more dependent on electricity. As but one example, the electronic digital clock, now found in most American homes and workplaces on everything from microwave ovens to radios, blinks if there is even a split-second power interruption. With such electronic reminders, brief interruptions no longer go unnoticed. This new awareness affects customers' perception of utilities' performance.

The need for an increased emphasis on quality in the electric utility industry is also driven by an internal force—employees. Historically, many young people went to work for utilities with the expectation of a stable job and regular, if not rapid, advancement. Today, many employees of utilities—as well as other industries—seek greater involvement in decision-making and problem-solving and demand greater recognition and reward for achievement.

Satisfying the rising expectations of both customers and employees is a prerequisite to the survival and success of electric utilities in an increasingly competitive environment. We cannot assume that the next 15 years will be any less tumultuous than the last. In fact, it's safe to assume the pace and magnitude of change will increase. We can expect that our customers will demand greater choice in how their energy needs are met and that our employees will demand a greater voice in how their talents are employed.

As a growing number of electric utilities are demonstrating, a total commitment to quality—in fact and in perception—provides an effective vehicle for meeting the challenges of the future and for shaping events rather than just reacting to them.

A Sampling of Electric Utility Quality Initiatives

Florida Power & Light Company has extensive experience with a quality program. Drawing upon elements of a successful quality assurance and construction program, the company announced in 1981 a formal Quality Improvement Program (QIP). At the time, FP&L chairman Marshall McDonald called for a "permanent attitude change" and encouraged employees to "do it right the first time." "QIP," he has said, "is FP&L's way of encouraging innovative action and planning for change."

In establishing its program, Florida Power & Light sent managers to observe other companies and consulted with leading experts in quality improvement. By 1985, the company had moved into the second phase of its effort—"doing the right thing right the first time." Currently, the company has more than 1,300 QIP teams involving more than 7,500 employees. President John Hudiburg is convinced the effort to change the status quo is on the right track: "At FP&L, we don't need any more proof that quality and productivity improvement is the wave of the future."

Delmarva Power & Light, another electric utility with considerable experience in quality improvement, began its Participation Skills Program (PSP) in 1982. Today it has over 350 teams involving the majority of its 2,500 employees. Although PSP was created as a program to encourage employee involvement in identifying and developing new ideas, Delmarva intends for it to become an ongoing way of doing business.

"The goal of PSP," says Delmarva chief executive officer Nevius M. Curtis, "is to develop a work environment which increases the involvement and commitment of individual employees, encourages team participation, recognizes the worth and dignity of all employees, and improves the ability of the company to carry out its objectives."

Georgia Power Company announced the creation of a program of quality circles in early 1982. Since the International Brotherhood of Electrical Workers joined the effort in August of that year, the program has expanded rapidly.

Georgia Power now has over 500 circles involving more than 4,000 employees. Of the problems addressed by these circles, approximately 80 percent have concerned

"Do it right the first time" is the theme of employee programs.

Robert Rathe/Folio, Inc.

job efficiency and 20 percent have dealt with the quality of work life. The company has documented direct cost savings as a result of the program. In addition, employee opinion surveys indicate that the work force is more satisfied than prior to the program.

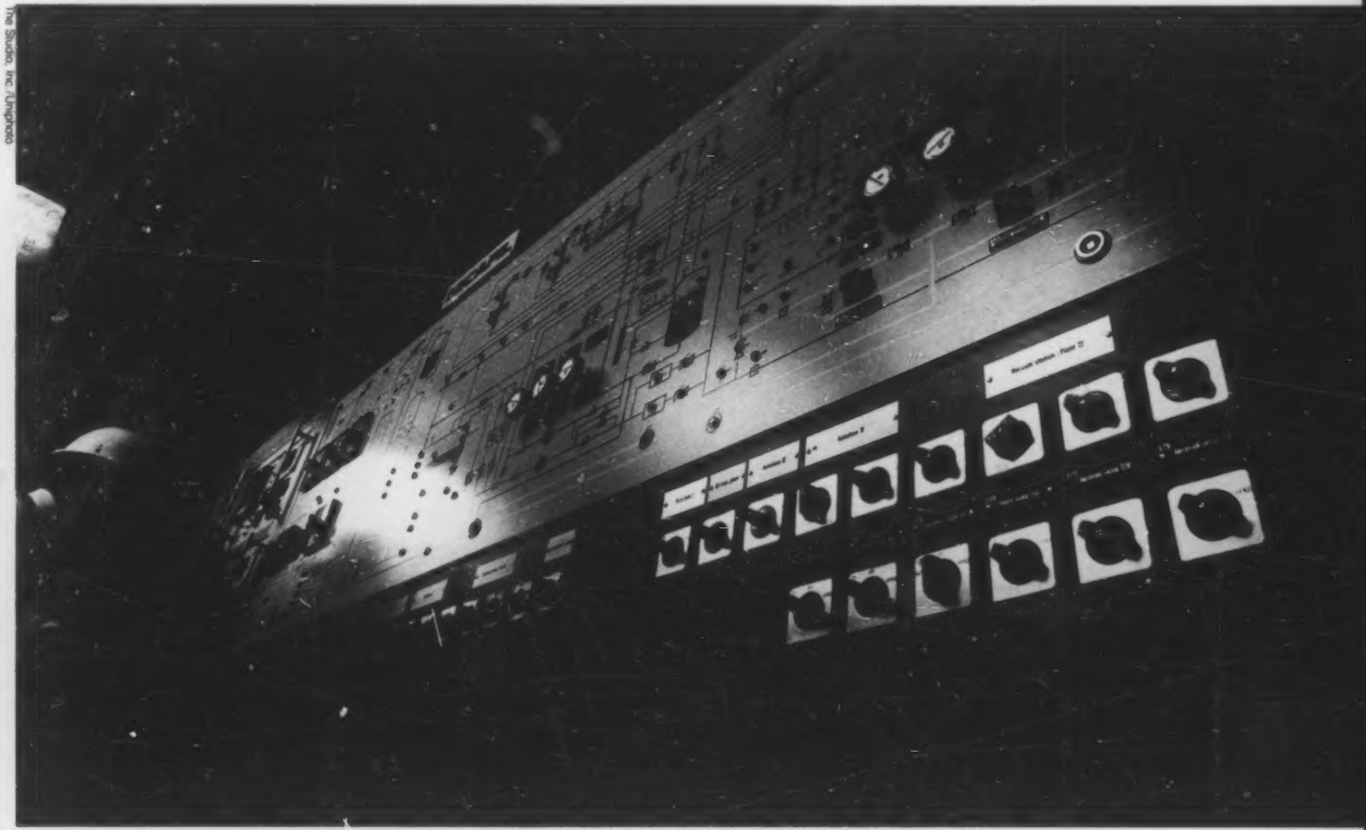
More recently, Houston Lighting & Power Company initiated a Productivity Improvement Program. Before HL&P set corporate improvement goals, an interdepartmental task force visited almost 100 companies, mostly non-utility. For 1986, the company has set department-level improvement goals as well and has linked them with its incentive/compensation system.

"Three elements that have been critical to our process are executive management commitment, line manager ownership, and employee involvement," says D. D. Sykora, president and chief operating officer of HL&P.

Pacific Gas and Electric Company also emphasizes productivity. Its Productivity Enhancement Program is coordinated with an organizational effort designed to increase customer satisfaction. Seeing a need to meet increased energy competition, among other reasons, PGandE has put productivity coordinators in various departments and in its field organization as one part of its strategy. To strengthen this effort as an ongoing part of its regular activities, the company is linking productivity goals to its budgeting and long-range planning in 1986.

At Dominion Resources, "Quality, Productivity, and Innovation" is the theme of a process begun in 1985 when the company formed employee involvement teams in 16 departments. The problem-solving teams were successful enough to warrant company-wide expansion of the concept in 1986. The company trains its employees in a ten-step problem-solving process. By the end of 1986, Dominion Resources expects to have 150 to 200 teams involving about 2,000 employees.

"As our company looks to the future," says chief executive officer W. W. Berry, "we must increasingly focus on excellence in manage-



The Studio, Inc./Uniphoto

ment and operations—on shaping our business activities to improve our efficiency, effectiveness, and profitability."

This is just a sampling of the utilities involved in some form of self-improvement activity related to quality. Success stories range from multi-million-dollar savings in reducing the length of a nuclear refueling outage to the intangible yet substantial benefits of enhanced employee teamwork and morale.

Quality Leadership

Although the precise terminology and mix of techniques vary from company to company, successful quality efforts share key underlying premises.

The support of middle management is crucial in bridging the gap between upper and lower levels.

Frank Siteman/Uniphoto

One is that upper management must lead, not just point the way. Quality is a responsibility that cannot be abdicated. In his fable *I Know It When I See It,* John Guaspari says, "Quality is everyone's job. But it's management's responsibility."[5] Quality by executive decree is an illusory notion at best. At worst, it promotes an atmosphere of blame and divisiveness, in which employees can become frustrated and embittered by problems largely beyond their control.

When we at Carolina Power & Light Company committed to a total quality emphasis, we recognized that it would demand a considerable amount of executive attention and time. In retrospect, it seems the extent of executive involvement is even greater than originally estimated.

Meeting as the Quality Council once a month is but a small part of our senior management team's participation. Over the past six months, we have met with a number of quality experts as well as executives of companies who have proved that a genuine commitment to self-improvement can produce beneficial change. In addition, we have met with the various other levels of management within our company to explain the concept, justify the need, solicit ideas, and enlist support.

We are carrying the quality message directly to all employees. For example, we have held a separate series of meetings with department heads, section managers, and unit managers. And in the first quarter of 1986, quality will be a major focus of our annual information meetings for all supervisors. They then will discuss the information with their employees. The quality message will be reinforced and amplified with information on a continuing basis through a variety of media.

Management sets the tone, the pace, the example. Doing so requires visible leadership. Otherwise, many employees may conclude that total quality is "just another program." The quality message—the quality attitude—should be transmitted by word and deed to every employee in the organization. Explicit in that message should be the understanding that it is in every employee's self-interest for the company to achieve high levels of performance. A motive behind this broad, deep, and time-consuming involvement of the entire management structure is the realization of the vital role middle management plays. Senior management may provide the initial impetus for change, but sustaining

Quality service requires teamwork and the belief by all employees that it's worth the effort.

Virginia Power

the momentum requires full employee participation and the active support of middle management.

As part of its leadership responsibility, management, I believe, should integrate quality into the overall business strategy of the company. Quality, it seems to me, should be clear and visible in the company's stated mission. It should be a common thread that strengthens the fundamental consistency and integrity of the way the company conducts its business.

The strategic approach also includes the commitment to create an environment or culture in which quality can grow and prosper over the long term. Companies that embark on the quality process without proper consideration of the existing management practices and styles and the existing corporate culture do so at some risk of failure. Good ideas, like good seed, cannot grow and flourish in a hostile environment. Unless you are willing to engage in a participatory style of management, quality programs are unlikely to be very successful.

The ultimate goal is to make quality—and the spirit of teamwork that is so central to it—a part of the corporate culture. In our expanded effort at CP&L, we are striving to make quality an embedded part of everyone's working day, just as safety has been for decades. Over a long period of time, our employees have won many national and regional awards for their safety performance. In part, this is because they clearly understand safety's priority, the individual and group responsibility it entails, and the recognition achievement brings. We are trying to instill that same level of understanding and commitment among employees toward quality.

Another key to the success of a quality effort is that it be a company-wide undertaking. If it is perceived as just another program, particularly just another staff program, then its chance of success is dim. Employees representing all major functional areas within the organization should participate in its design and implementation. Widespread ownership marks the difference between token commitment and active support.

New attitudes, styles, and skills don't just happen. There must be massive education and training to translate quality from an abstract concept to a concrete reality. Many companies, such as Westinghouse, for example, organize their education and training around the concept of a Quality Institute. It provides a focal point for redirecting the resources dedicated to management development and skills training.

A People Focus

Another hallmark of a successful quality effort is a focus on people. "People Serving People," the familiar slogan used by many utilities, aptly captures the human nature of the utility enterprise. Tom Peters, co-author of *In Search of Excellence* and *A Passion for Excellence,* says in a recent article, "The source of superior quality is not so much machines as people."[6] Our industry, justifiably attentive to new capital projects and innovative technologies, must be equally cognizant of the people side of the business.

"People Serving People" also indicates that the human focus is a dual one: external and internal. The external focus is on the customer. As part of CP&L's research into quality programs, we conducted a survey of our 15 largest industrial customers. Every one has some form of quality improvement effort. Do you think those customers expect any less of their power supplier?

Recently, the customer service

Utilities must mine the reservoir of talent and dedication among their employees.

employees at CP&L have operated under the theme of "Customer Satisfaction: Our Basic Business." It is a concept all employees, not just those who interact directly with customers, should live by daily. Moreover, utilities should not act solely on their perception of the needs and expectations of customers. The gap between perception and reality can be wide and misleading. There are a number of market research techniques, commonly used by consumer product companies, that can be employed to narrow the gap by providing reliable data about real customer expectations and needs.

The focus on service to others within the company is equally important. Here, too, surveys, focus groups, and other forms of research can sharpen our vision of employees' real needs and expectations. Electric utilities, on the whole, have a great many employees who are talented, dedicated, and caring. Yet, in many companies employees may be an underutilized resource. If quality programs are to work, they must produce an environment that encourages—and rewards—employee participation. Only then will each employee work to his or her full potential and make the kind of contribution that leads to improvement in overall operating results.

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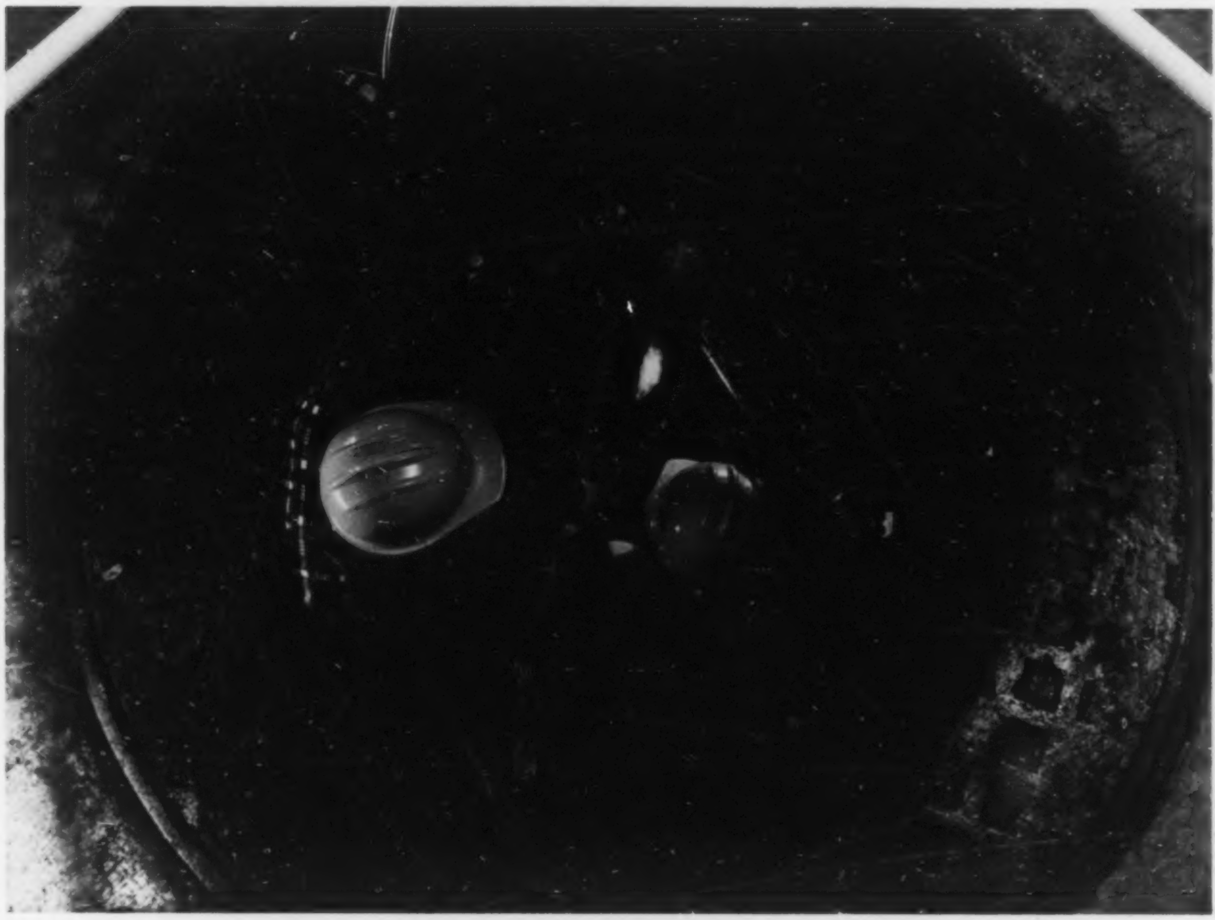
Charles Feil/Uniphoto

Hard Work, Not Magic

It would be unwise for any utility to undertake a quality improvement effort in hopes of discovering a solution for every problem. Quality circles by themselves or any other single management technique cannot provide all the answers. In fact, quality is not a technique at all but an attitude put into action. Quality initiatives don't succeed because of the novelty of the ideas and techniques, but because of determination, persistence, and skill of implementation.

The Edison Electric Institute should be able to serve a valuable role in furthering the cause of quality within the electric utility industry. EEI can be a clearinghouse for information and a forum in which utility executives and quality managers share ideas conceived, les-



Robert Rathe/Folio, Inc.

Quality is an attitude, not a technique.

sons learned, and practices developed. In addition, EEI can be an effective advocate for quality, supporting the national focus on quality and promoting it within the industry as we enter the period of our greatest challenge.

The decision to commit to a total quality effort at CP&L is as important and far-reaching as any I've made as chief executive officer. Likewise, such a commitment by EEI and our industry should not be taken lightly. Historically, because of the regulatory environment, ours has been made a risk-averse industry. And there may be risk in initiating a massive quality effort in any organization. I'm convinced, however, with regard to my own company, that in an environment demanding excellent service, reasonable prices, flexibility of supply and innovation, the greater risk would be not to proceed into the development of a total quality effort.

A century ago, Thomas Edison said, "Discontent is the first necessity of progress." Now here is a question: Does our industry find sufficient discontent from the winds of change to renew its commitment to progress? What gives me greatest hope is the spirit and determination among our employees to discover better ways to do business. For utility managements, the quality focus can be a way to unleash that potential. Properly understood and implemented, quality should not be just a method of change, it should be an inspiration to excel. ■

Notes

1. "The Renaissance of American Quality," advertising section in *Fortune*, October 14, 1985.

2. *Ibid.*

3. News Release, American Society for Quality Control, June 13, 1985.

4. Jane M. Clemmensen and Ralph J. Ferraro. "The Emerging Problem of Electric Power Quality," *Public Utilities Fortnightly*, November 28, 1985, pp. 18-25.

5. John Guaspari. *I Know It When I See It: A Modern Fable About Quality* (New York: American Management Association, 1985), p. 65.

6. Tom Peters. "The Customer is Still Right," *U.S. News & World Report*, December 30, 1985, p. 77.

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STATISTICAL REVIEW

HOW CAPITAL INTENSIVE IS THE ELECTRIC UTILITY INDUSTRY?

The electric utility industry is the most capital-intensive industry in the American economy. That is, the amount of capital that must be invested in plant and equipment in order to produce electricity is relatively greater than for any other product. Capital intensity can be measured on either a dollar basis or a time basis. Table 1 shows the capital investment necessary to yield a dollar's worth of annual output. It takes an investment of $2.89 to earn a dollar in the electric business, more than in any other business. Table 2 shows the time required for various industries to "turn over" the cost of investment, or, in other words, for the assets invested to produce an equivalent amount of sales revenue. Revenue from almost three years of electricity sales is needed to match the electric utility industry's assets.

Why do electric companies require so much capital? The reason is partly because the most efficient way of producing electricity requires a tremendous investment in power plants, generating equipment, and transmission and distribution facilities. Other industries with production processes requiring less fixed capital are able to turn over their investment much faster. For instance, the food industry and the automobile industry turn over their capital almost twice a year, while wholesale trade does so three times a year.

Even when compared with the most capital-intensive or "heavy" manufacturing industries, the electric utility industry ranks much

Table 1
Capital Investment per Dollar of Sales

Industry	Assets Per Dollar of Revenue*		
Investor-Owned Electric Utilities[1]	$2.89		
Mining[2]	2.19		
Railroads[3]	1.51		
Communications**[4]	1.20		
Investor-Owned Gas Utilities & Pipeline Industry[5]	0.71		
All Manufacturing[2]	0.77		
Food & Kindred Products		$0.54	
Tobacco Manufacturers		1.09	
Textile Mill Products		0.58	
Paper & Allied Products		0.80	
Printing & Publishing		0.69	
Chemicals & Allied Products		0.91	
Industrial Chemicals			$0.96
Drugs			1.13
Petroleum & Coal Products		1.08	
Rubber & Misc. Plastic Products		0.58	
Other Nondurable Mfg. Industries		0.49	
Stone, Clay, & Glass Products		0.80	
Primary Metal Industries		0.86	
Iron & Steel			0.80
Nonferrous Metals			0.95
Fabricated Metal Products		0.64	
Machinery, Except Electrical		0.90	
Electrical & Electronic Equipment		0.78	
Transportation Equipment		0.67	
Motor Vehicles & Equipment			0.55
Aircraft, Guided Missiles, & Parts			0.87
Instruments & Related Products		0.91	
Other Durable Manufacturing Prods.		0.57	
Wholesale Trade[2]	0.33		
Retail Trade[2]	0.44		

*Average net assets and annual revenue for 1984.

**Assets, year-end 1984 only (AT&T data not comparable before 1984).

Sources:

[1] "Average Quarterly Assets and Total Annual Sales, 1984." *Quarterly Financial Report for Manufacturing, Mining, and Trade Corporations*, U.S. Bureau of the Census.

[2] "Net Total Electric Utility Assets, Average Year-End 1983 and Year-End 1984," and "Electric Department Operating Revenues, 1984." *Statistical Yearbook*, Edison Electric Institute.

[3] "Assets, Average Year-End 1983 and Year-End 1984," and "Operating Revenues, 1984." *Gas Facts*, American Gas Association.

[4] "Net Investment in Plant and Equipment, Average Year-End 1983 and Year-End 1984," and "Operating Revenues, 1984." *Yearbook of Railroad Facts*, Association of American Railroads.

[5] "Assets, Year-End 1984 Only (Data before 1984 not comparable)," and "Operating Revenues, 1984." *Moody's Public Utility Manual*.

Table 2
Sales Turnover

Industry	Revenue Equals Assets*
Investor-Owned Electric Utilities	Once every 2 years, 11 months
Mining	Once every 2 years, 2 months
Railroads	Once every 1 year, 6 months
Communications**	Once every 1 year, 2 months
Drugs	Once every 1 year, 2 months
Petroleum & Coal Products	Once every 1 year, 1 month
Chemical & Allied Products	Once every 11 months
Iron & Steel	Once every 10 months
Investor-Owned Gas Utilities & Pipeline Industry	Once every 9 months
All Manufacturing Corporations	Once every 9 months
Motor Vehicles & Equipment	Once every 7 months
Food & Kindred Products	Once every 7 months
Wholesale Trade	Once every 4 months

*Average net assets and annual sales for 1984.
**Assets, year-end 1984 only (AT&T data not comparable before 1984).

higher in capital invested per dollar of sales. To generate $1.00 of revenue the drug industry needs $1.13 of assets, the petroleum and coal industry $1.08, and iron and steel only $.80. In addition to using large amounts of fixed capital to produce and distribute electricity, the electric utility industry must maintain a significant margin of extra generating capacity. This is because it differs from most other industries in that its product is a service that must be "made to order" every time a customer employs any of its thousands of applications. Electric utility companies cannot generate electricity to store for future demand. Instead, they must have facilities to meet the maximum demand for electricity at any instant, as well as a reserve margin of generating capacity beyond peak demand to insure reliability of service.

As service industries with capacity requirements similar to that of the electric utility industry, railroads and communications also need relatively large amounts of capital. However, they still require significantly less investment than the electric companies. Only mining approaches the electric utility industry in being the most capital-intensive of all industries. ▰

Contributed by the Statistics Department of Edison Electric Institute.

TECHNOLOGY REVIEW

THE NEW BECHTEL CT-121 SCRUBBER

Bechtel National, Inc., of San Francisco, California, recently signed a license agreement with Chiyoda of Japan to offer the Chiyoda Thoroughbred 121 flue gas desulfurization process in the United States and Canada.

The new CT-121 scrubber, illustrated in Figure 1, operates by a simple, reliable, efficient process that uses inexpensive limestone as a reagent and produces a dry, chemically stable gypsum byproduct.

At the heart of the new CT-121 process is a patented absorber, called a jet bubbling reactor (JBR), in which flue gas is bubbled into a shallow layer of absorbent. This device, which represents a significant improvement in sulfur dioxide (SO_2) absorption technology, makes it possible to use energy more efficiently and to eliminate the problems and limitations of first-generation lime/limestone scrubbing processes. The design of the JBR permits all the four steps of absorption, oxidation, neutralization, and crystallization to be accomplished in a single process vessel. This feature has made it possible to eliminate many normally required pieces of equipment, thereby simplifying the process.

The basic difference between the CT-121 process and first-generation lime/limestone processes, from a chemistry point of view, is the ability to operate at a lower pH. The operation at a lower pH level (3.5 to 5.0 compared to 5.5 to 6.0) is for the express purpose of eliminating the three drawbacks of conventional limestone processes, namely: (1) poor reagent utilization, (2) operational and reliability problems resulting from scaling and plugging, and (3) production of a hard-to-dewater sludge.

Table 1
Commercial CT-121 Plants

Owner	Flue Gas Source	Capacity (scfm)	Capacity (MW)	Start-Up Date	SO_2 Inlet Concen. (ppm)	SO_2 Removal (%)	End Use of Byproduct Gypsum
Mitsubishi Petrochemical Co.	Boiler, 4.0 wt.% S. oil	162,000	87*	1982	2000	98	Wallboard Cement
Nippon Mining Co.	Boiler, 5.0 wt.% S. oil	137,000	75*	1983	2500	98	Cement
Toyama Kyodo Electric Power Co.	Boiler, 1.2 wt.% S. coal	430,000	200	1984	750	90	Wallboard
Toyama Kyodo Electric Power Co.	Boiler, 1.2 wt.% S. coal	430,000	200	1984	750	90	Cement
Kashima Northern Joint Electric Power Co.	Boiler, 4.0 wt.% S. oil	405,000	225*	1985	2000	97	Wallboard
University of Illinois	Boiler, 3.5 wt.% S. coal	110,000	45*	1986	3000	94	Wallboard

*Equivalent capacity

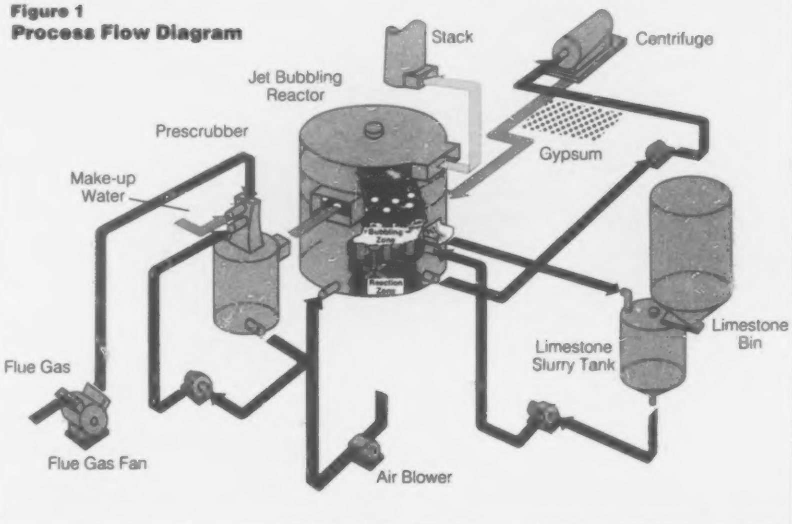
The usual causes of scaling encountered in conventional lime/limestone scrubbing systems are due to calcium sulfite, calcium sulfate, and unreacted limestone. These causes are eliminated in the CT-121 process by its operation at a lower pH, by the introduction of oxidizing air, and by an increase in the reactor liquid residence time. These conditions ensure (1) complete oxidation, eliminating the possibility of scaling due to calcium sulfite, as no calcium sulfite is formed, (2) complete limestone dissolution, eliminating the possibility of scaling due to unreacted limestone, and (3) providing sufficient nucleation sites (gypsum crystals) in the absorber for calcium sulfate precipitation, eliminating the possibility of hard calcium sulfate scale forming on the scrubber walls and internals.

This combination of new mechanical simplicity and simplified process chemistry should prove to be advantageous to utility operators seeking ways to comply with existing and future regulations.

The initial development of the CT-121 process in the United States began with a 23-megawatt demonstration project. The project was conducted at the Scholtz Station of the Gulf Power Company of Florida. Sponsors of the project were Gulf Power, Southern Company Services, the Electric Power Research Institute, and Chiyoda. Since that time, five commercial units have been placed in service, and one unit is in the engineering and construction phase. A summary of these units' design conditions is shown on Table 1.

In each of the commercial plants identified in Table 1, the operating

Figure 1
Process Flow Diagram



experience has been reported to be extremely good. In all cases, the SO_2 removal efficiency has exceeded the design requirements using essentially stoichiometric amounts of limestone. In addition, the system reliability has been or approached 100 percent for each of the operating systems. An interesting facet of this high reliability is that it has been achieved without the use of spare scrubbers. This operating performance record may prompt U.S. regulatory agencies to rethink their current requirement for spare scrubbing capacity on new installations.

In summary, the advantages that the CT-121 technology offers include:

- Process configuration simplicity due to fewer pieces of equipment.
- Production of a dry gypsum product, which is easy to handle and capable of being sold for the manufacture of wallboard or cement or used in agriculture as a fertilizer or soil conditioner.
- High reliability—approaching 100 percent without spare scrubbers.
- High desulfurization efficiency—greater than 95 percent.
- Full limestone utilization because of low pH operation.
- Low plot space requirements.
- Low operating and maintenance costs.
- Low investment costs.

Contributed by B. R. Gilbert, Manager, Emission Control, Advanced Technology Division, Bechtel National, Inc.

FINANCIAL REVIEW

THIRD-QUARTER EARNINGS PER SHARE DECLINE 3.4 PERCENT

Third-quarter earnings per share fell 3.4 percent for the investor-owned electric utility industry compared to the third quarter of 1984, primarily as a result of a 7.2 percent increase in shares outstanding (see Table 1). The industry earned 92 cents per share on electric operating revenue of $34.9 billion, compared to 96 cents per share on electric operating revenues of $33.8 billion during the third quarter of 1984. Twelve-month earnings were $3.12, a slight decrease from the $3.14 the industry earned for the twelve months ended September 30, 1984. The return on average common equity was 14.2 percent for the twelve-month period, compared to 14.5 percent for the twelve months ended June 30, 1985.

Electric operating revenues registered their smallest increase since the first quarter of 1983, on a 4.2 percent increase in kilowatt-hour sales. After the rate of increase peaked in the second quarter of 1984, it has continued to increase, but at a decreasing rate. Increases in electric operating expenses also showed the smallest gain since the first quarter of 1983. A continued decrease in fuel expense and a decline in tax expenses—(1) provision for deferred income taxes and (2) investment tax credit adjustment—contributed to the decline in expenses. The electric operating ratio for the third quarter of 1985 was 78.8 percent, compared to 79.2 percent a year ago.

The industry's assets increased 7.1 percent to $399 billion in the third quarter of 1985 (see Table 2). Plant in service (net utility plant minus construction work in progress [CWIP]) increased 15.6 percent. CWIP declined for the second quarter in a row. The 10.1 percent decrease accompanied a drop in the ratio of CWIP to plant in service from 47.5 percent a year ago to 36.9 percent for the third quarter of 1985.

Refundings continued through the third quarter, when over a billion dollars in long-term debt was issued for refunding purposes. According to Ebasco Business Consulting Company's "Analysis of Public Utility Financing," this is more than three times the amount of refundings done in the third quarter of 1984, and it is nearly half the $2.6 billion which the industry has refunded during 1985. Total securities offerings by electric utilities in the third quarter, not including dividend reinvestment plans, were $4.1 billion, an increase of 34 percent over the same period a year ago. Of the $9.9 billion in total financings issued through September 30, 1985, over one-third, or $3.8 billion, were pollution control bonds. Third-quarter activity accounted for about half of that total, reflecting in part the industry's uncertainty about tax reform proposals that would eliminate this form of financing in the future as well as funding for pollution control facilities for plants under construction in the 1980s.

Long-term debt increased 5.8 percent to $147 billion, but declined slightly to 47.7 percent of total capitalization from 48 percent one year ago. Total common stock equity increased to 42.1 percent of total capitalization from 40.9 percent while common stock grew 8 percent to $84 billion. Preferred stock, which decreased 1 percent

Table 1

Investor-Owned Electric Utility Industry Statement of Income

(Unaudited)
(Millions of Dollars)

	Three Months Ending September 30,			Twelve Months Ending September 30,		
	1985	1984	% Change	1985	1984	% Change
Total Electric Operating Revenues	$34,891	$33,798	3.2	$123,758	$117,196	5.6
Electric Operating Expenses						
Fuel	$10,128	$10,668	(5.1)	$ 37,178	$ 37,267	(0.2)
Other Operation & Maintenance	8,330	7,483	11.3	32,111	28,882	11.2
Depreciation & Amortization	2,625	2,336	12.4	10,012	8,964	11.7
Taxes Other Than Income Taxes	2,354	2,285	3.0	8,787	8,426	4.3
Income Taxes (Federal & Other)	2,391	2,077	15.1	5,235	4,343	20.5
Provision for Deferred Income Taxes	1,138	1,203	(5.4)	4,848	4,836	0.2
Investment Tax Credit Adjustment, Net	537	721	(25.6)	1,703	2,042	(16.6)
Total Electric Operating Expenses	$27,501	$26,773	2.7	$ 99,872	$ 94,760	5.4
Electric Operating Income	$ 7,389	$ 7,025	5.2	$ 23,885	$ 22,436	6.5
Other Utility Operating Income	105	124	(15.4)	1,429	1,485	(3.8)
Total Utility Operating Income	$ 7,494	$ 7,149	4.8	$ 25,314	$ 23,921	5.8
Other Income & Deductions—Net	$ 633	$ 495	27.8	$ 2,491	$ 2,007	24.1
Allowance for Other Funds Used During Construction	1,256	1,314	(4.4)	5,196	5,182	0.3
Total Income Before Interest Charges	$ 9,383	$ 8,958	4.7	$ 33,001	$ 31,110	6.1
Interest Charges						
Interest on Long-Term Debt	$ 3,710	$ 3,518	5.5	$ 14,502	$ 13,395	8.3
Other Interest Expenses & Charges	255	347	(26.4)	1,035	1,201	(13.8)
Allowance for Borrowed Funds Used During Construction	(712)	(851)	(16.3)	(3,052)	(3,261)	(6.4)
Net Interest Expenses & Charges	$ 3,253	$ 3,014	7.9	$ 12,485	$ 11,335	10.1
Net Income Before Extraordinary Items	$ 6,130	$ 5,944	3.1	$ 20,516	$ 19,775	3.7
Extraordinary Items	0	0	0	(55)	(166)	(66.9)
Net Income	$ 6,130	$ 5,944	3.1	$ 20,461	$ 19,609	4.3
Preferred Dividends Declared	733	734	(0.2)	2,899	2,902	(0.1)
Net Income Available for Common	$ 5,397	$ 5,210	3.6	$ 17,562	$ 16,707	5.1
Common Dividends Declared	3,011	2,746	9.6	11,850	10,842	9.3
Additions to Retained Earnings	$ 2,386	$ 2,464	(3.2)	$ 5,712	$ 5,865	(2.6)
Avg. Shares Outstanding	5,840	5,446	7.2	5,632	5,326	5.7
Earnings Per Share*	$ 0.92	$ 0.96	(3.4)	$ 3.12	$ 3.14	(0.6)
Common Dividends Per Share*	$ 0.52	$ 0.50	2.2	$ 2.10	$ 2.04	3.4

*Based on average shares outstanding as reported to EEI by survey respondents and adjusted for stock splits.
NOTE: Revenues are adjusted for intra-industry sales for resale of electricity.

Based on unaudited reports submitted by a sample of electric utilities which account for approximately 94 percent of the industry's revenues from sales to ultimate customers and 93 percent of the industry's total assets.

Table 2
Investor-Owned Electric Utility Industry Balance Sheet
As of September 30, 1985
(Unaudited)
(Millions of Dollars)

Assets	**1985**	**1984**	**% Change**
Utility Plant*			
Utility Plant (Including Nuclear Fuel)	$335,982	$294,953	13.9
Less Accumulated Depreciation	91,712	83,677	9.6
Total	$244,270	$211,276	15.6
Construction Work in Progress	90,157	100,265	(10.1)
Net Utility Plant	$334,428	$311,541	7.3
Investments	7,669	7,209	6.4
Current Assets	38,129	36,835	3.5
Deferred Debits	19,267	17,453	10.4
Total Assets	$399,492	$373,038	7.1
Capitalization & Liabilities			
Capitalization			
Common Stock	$ 84,136	$ 77,872	8.0
Retained Earnings	45,523	40,566	12.2
Preferred Stock	31,556	31,910	(1.1)
Long-Term Debt	147,087	139,023	5.8
Total Capitalization	$308,302	$289,371	6.5
Current Liabilities			
Short-Term Debt	$ 4,654	$ 5,162	(9.8)
Long-Term Debt Due Currently	4,668	4,200	11.2
Other Current Liabilities	28,158	27,723	1.6
Total Current Liabilities	$ 37,480	$ 37,085	1.1
Deferred Credits			
Accumulated Deferred Income Taxes	$ 30,792	$ 25,574	20.4
Accumulated Deferred Investment Tax Credits	15,276	14,120	8.2
Other Deferred Credits	7,642	6,888	11.0
Total Deferred Credits	$ 53,710	$ 46,582	15.3
Total Capitalization & Liabilities	$399,492	$373,038	7.1

*Includes other utility plant of combination gas and electric companies.

*Based on average shares outstanding as reported to EEI by survey respondents and adjusted for stock splits.
NOTE: Revenues are adjusted for intra-industry sales for resale of electricity.

Based on unaudited reports submitted by a sample of electric utilities which account for approximately 94 percent of the industry's revenues from sales to ultimate customers and 93 percent of the industry's total assets.

to $31.6 billion, slipped to 10.2 percent of total capitalization from 11 percent a year earlier.

Pre-tax interest coverage (including allowance for funds used during construction) was flat at 3.6 times for the quarter, compared to a year ago. Interest coverage for the twelve-month period was 3.08 times, unchanged from the previous two quarters of 1985. Bond ratings of the electric utilities reflect the dichotomy between the improving financial condition of most electric utility companies and the increasing uncertainty related to the industry's heavy construction programs. Through the third quarter of 1985, Moody's increased its ratings on the senior debt securities of 23 electric utilities, while lowering the ratings of 11. Standard and Poors' registered seven increases and ten decreases during the same time period.

The attached financial statements are based on unaudited reports submitted by a sample of electric and combination companies. The utilities used in the sample account for 95 percent of the industry's revenue from sales to ultimate customers and 94 percent of the industry's total assets. The data was expanded to represent the entire investor-owned electric utility industry.

Contributed by the Finance and Regulation Department of Edison Electric Institute.

REGULATORY REVIEW

EEI COMMENTS ON COAL RATE GUIDELINES

After seven years of proceedings, the Interstate Commerce Commission (ICC) issued on September 3, 1985, its long-awaited nationwide coal rate guidelines. The guidelines contain, with few changes, a set of "constrained market pricing" principles first proposed by the commission in February 1983 for use in "determining the reasonableness of rail captive coal rates."

The guidelines reaffirm a series of four constraints for determining maximum reasonable rates for rail transportation of coal. "Viewed in their most favorable light," Edison Electric Institute (EEI) said in subsequent testimony to a Senate subcommittee, "the commission's coal rate guidelines fail to provide any meaningful measure of protection for the vast majority of captive rail shippers."

Shippers of coal who believe rates charged by railroads are too high are considered wrong until they can prove themselves right—if they can do so at all under the complex, difficult, and expensive procedures mandated by the ICC guidelines.

Coal remains the single most profitable commodity for most major U.S. railroads, and electric utilities are by far the largest buyers, shippers, and users of coal throughout the country. In fact, more than three-quarters of the coal produced domestically in 1984 was bought by electric utilities, and two-thirds of that coal—460 million tons—was shipped by rail to power plants.

Most utility coal shipped by rail is captive, *i.e.*, there is no viable option for transporting a utility's required coal supplies other than by a single rail route. Congress recognized this fact in the 1980 Staggers Rail Act, a major goal of which was "to provide a regulatory process that balances the needs of railroads, shippers, and the public" and "to maintain reasonable rates where there is an absence of effective competition."

Tim Wright

Electric utilities that are captive coal shippers say the ICC's coal rate guidelines don't wash.

The four constraints imposed on coal rail rates in the ICC guidelines relate to "stand-alone" transportation cost, the "revenue adequacy" of railroads, the "management efficiency" of rail companies, and the possibility of "phasing-in" rate increases. In each instance, EEI has found that the purported constraints and the terms for their implementation frustrate the intent

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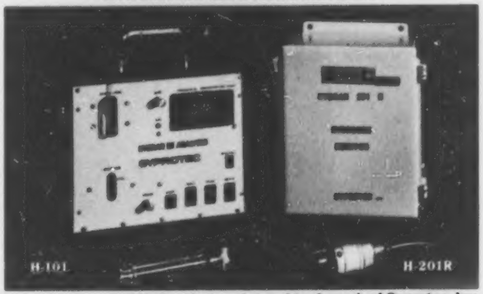

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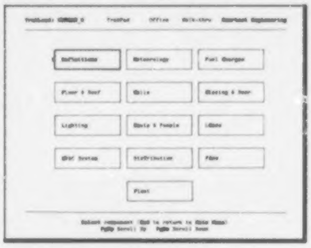

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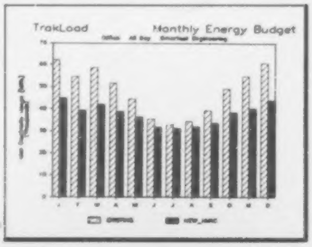

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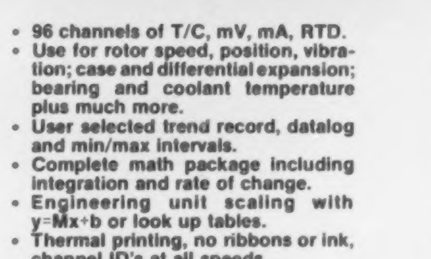

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of Congress to protect captive shippers of coal.

In order to sustain an objection to coal transportation rates under the stand-alone criterion, a shipper would be required to prove that a transportation tariff filed by a railroad is higher than the price the shipper would have to pay to provide similar service itself. To accomplish this, a shipper would have to demonstrate that a hypothetical new railroad or alternative transportation system could be built, operated, and maintained so as to provide lower rates to the shipper than the rates proposed by the existing railroad.

In the real world, factors totally unrelated to economics are likely to preclude the building of any major new rail lines. Yet any shipper objecting to a filed rail tariff would have to present exhaustive studies and expert testimony in at least nine separate specialized areas of engineering, operations, cost accounting, and financing. The shipper bears the burden of proof for each and every element of this theoretical exercise, and, even if it could show successfully that a substitute railroad or alternative transportation system could be built and operated more economically than an existing line, there is no guarantee that the ICC would act to reduce filed tariffs. The commission has only promised to take "appropriate" action.

EEI testified that the stand-alone cost constraint is "out of the question as a meaningful 'remedy' for most captive rail shippers."

Under the ICC rate guidelines, the only way the second constraint, revenue adequacy, could be used to argue for lower rail rates would be for the railroad in question to be revenue adequate and for the shipper to prove that the level of differential pricing charged the shipper for coal transportation is not needed to keep the railroad revenue adequate.

However, the ICC has found all 31 of the nation's major "Class I" railroads to be revenue *in*adequate, including the railroads controlled by the Norfolk Southern system, which has been singled out by the Department of Transportation as financially healthy enough to spend $1.2 billion to acquire the Conrail routes from the government. It is unlikely that the ICC will soon be able to implement the revenue adequacy constraint.

EEI's Congressional testimony labeled the revenue adequacy constraint offered by the ICC "utterly useless" as a protection for captive shippers "until realistic standards of revenue adequacy are employed."

The burden of proof is again on the shipper to show railroad management inefficiency in arguing for lower rates under the third constraint. To make such a showing, a shipper contesting a rate for an individual movement would have to be able to analyze virtually all of the operating, plant management, and pricing data for the entire railroad. This constraint is "entirely illusory as a remedy," EEI testified.

The fourth constraint, to which the commission devoted less than a page of its 49-page ruling, provides the potential for a phasing-in of rate increases granted, to avoid "severe economic dislocations." The earlier ICC proposal in this proceeding allowed rates to rise 15 percent per year above inflation without review, but the latest guidelines substitute a case-by-case determination of whether—and how—rate increases should be imposed on shippers.

In view of the failure of the ICC to implement policies designed to reflect the intent of Congress in the Staggers Rail Act, EEI—along with agricultural interests, consumers, public utility commissions, and coal shippers—is supporting the Consumer Rail Equity Act, first proposed in 1985, to provide a mandate from Congress that leaves no doubt as to what the Senate and the House of Representatives want the ICC to do by way of protecting captive shippers.

The Staggers Act does not need a comprehensive overhaul, EEI testified. It does need revisions to "adopt a responsible and sensible test for railroad revenue adequacy," to "fairly allocate burdens of proof between shippers and railroads," to determine a "workable and realistic rate reasonableness standard for captive shipper rates," and to provide an inflation index that accounts for "changes in railroad productivity" and that requires "reductions in rail rates when rail costs decline."

Contributed by Paul M. Feine, a freelance writer on energy topics.

BOOK REVIEW

TOXIC TERROR

Elizabeth M. Whelan
Jameson Books, 1985
Ottawa, Illinois, 348 pp.

Reviewed by C. D. Everhart

"Cancer Epidemic." "America the Poisoned." "The Disaster of Love Canal." "Deadly Dioxin." "No Nukes."

Over the last two decades, these and similar slogans and labels have been thrust in a relentless stream at Americans—by television, newspapers, bumper stickers, books, and magazines, including the tabloids at supermarket checkout counters.

The impact of this incessant bombardment cannot be measured with any accuracy; one can only sense that, after this long, emotional barrage, many citizens may be fearful of what is happening around them and perhaps confused by the shouting but the absence of disaster.

Few among us have made the effort to look beyond what we've read and seen to learn whether there is another side to those issues. Elizabeth Whelan, author of *Toxic Terror*, has taken on that monumental job for us.

Dr. Whelan, who holds doctoral and masters degrees in epidemiology and is head of the American Council on Science and Health, examines the myths and the scientific findings surrounding air and water pollution, nuclear energy, the banning of chemicals, technological progress, and many other facets of living in today's world.

She readily admits her bias ("in favor of both health and technology."). She also shows her anger at the distortions, inaccuracies, and nonscientific "evidence" that have characterized much of the modern-day environmental movement, which she traces from its inception in the early 1960s. Yet, Dr. Whelan has with great care tried to be objective in treating these emotional subjects. She also understands the difference between black and white, and gray.

Her primary method of presentation is to state a charge, then supply all the scientifically based background she has mustered in her research.

Her technique is best illustrated in a chapter on air pollution. In *America the Poisoned*, authored by Lewis Regenstein and published in 1982, this statement appears: "We all know that air pollution is probably killing literally hundreds of thousands of Americans each year." Based on her analysis of data, Dr. Whelan responds: "There is no evidence whatsoever that air pollution is a major cause of death or disease in the United States today. There is ample evidence that the current air standards in this country are more than adequate to protect human health. A search for 'purer air' is an exercise which will only result in our spending additional billions of dollars, with no return in improved health."

This is not to say that Dr. Whelan dismisses air pollution out of hand as a health hazard. She readily admits that heavy pollution is a health hazard and in some instances can increase respiratory distress and cause premature death. Her point, however, in answering Regenstein, is to put his charge in some perspective; namely, that air pollution is not killing hundreds of thousands of Americans annually.

In evaluating the environmental movement and its components, Dr. Whelan emphasizes that the small, vocal fringe of environmental extremists, made up of "generalists" like Ralph Nader and a handful of scientists whose work has been largely discredited by the majority of the scientific community, does not represent the mainstream of American thought or attitude. Yet this tiny band of activists, through media coverage, has succeeded in blowing most environmental issues wildly out of proportion—Love Canal, Three Mile Island, acid rain, cancer, and on and on.

The author laments that many creditable scientists are unwilling to confront the extremists publicly. This leaves the public with the impression that the half a dozen scientists who appear most frequently in the press represent the majority opinion of the scientific fraternity. Most legitimate scientists and physicians, Dr. Whelan notes, "feel incompetent and uncomfortable appearing in public with glib, well-rehearsed 'environmental performers.'" She underscores this point by adding that most scientists may be afraid their colleagues might question "the propriety of their presence on a program that also features a quack, two unemployed actresses, and a male stripper." Still, she sounds an appeal for the legitimate scientists to let the media know they are available when subjects in their field of expertise are in the news.

Hypocrisy is not beyond the grasp of some environmental scientists, as a poignant story in *Toxic Terror* illustrates. Following an address at an anti-nuclear meeting, long-time critic Dr. Ernest Sternglass of the University of Pittsburgh was approached by a pregnant woman who said she was planning several trips to California and was anxious to know if air travel would increase her exposure to radiation. Momentarily assuming the role of the family physician reassuring his patient, Dr. Sternglass, rather than responding as the militant anti-nuclear activist that he in fact is, said that yes, there would be a slight increase in radiation, but there was no reason for her to change her travel plans or to worry. Thus, he admitted to her the truth. The small amount of increased radiation she would receive by flying would be the equivalent of what

Tim Wright

Americans are terrified of radiation from nuclear power plants, thanks to a few vociferous fearmongers.

a person would be subjected to from living next door to a nuclear power plant and standing naked outside the fence for 24 hours a day for one year.

Dr. Sternglass' "findings" on radiation from nuclear power stations have been discredited by the overwhelming majority of members of the scientific community over and over again, including his charge that "several hundred" infant deaths occurred as a result of the Three Mile Island nuclear accident in Pennsylvania. His assertion contradicts state health department studies which showed that the accident caused no human fatalities and no hazard to humans or animals.

The book also reveals that some studies and reports issued on environmental subjects have been shown to be false and misleading, having been conducted and released for what well may be political purposes. A case in point is the "estimates paper" on occupationally induced cancer. Appearing before an AFL-CIO conference in 1978, then Secretary of Health, Education, and Welfare Joseph A. Califano, Jr., said, "At least 20 percent of all cancer in the United States—and perhaps more—may be work-related."

This statement was taken from a draft report prepared by the National Cancer Institute and several other federal government agencies. The report received immediate and worldwide publicity; in addition, it has since been used as the basis for other government reports which, in turn, have also received wide publicity in the mass media.

According to Dr. Whelan, the "estimates paper" has been "the focus of more professional criticism and scorn than any government health document published in this decade." In a subsequent investigation, Dr. Whelan learned that seven of the 10 scientists apparently responsible for the statistics in the report believe the figures may be incorrect. Sir Richard Doll and Richard Peto, Oxford University cancer researchers, generally regarded as two of the world's foremost epidemiologists, called the report "scientific nonsense." They have observed that it is "likely it was written for political rather than scientific purposes and it will undoubtedly continue in the future . . . to be used by those who wish to emphasize the importance of occupational factors."

Anti-business rhetoric is another weapon employed by the vocal environmental faction. Technology and corporate greed, it says, are to blame for spoiling the environment and for causing irrevocable health problems. As the book makes clear, the exact opposite is closer to the truth. Science and technology over the last 50 years have increased life expectancy substantially, have produced food in quantities to feed America with surpluses for other countries, and in general have raised the standard of living for Americans beyond that of any other nation in the world.

What would be the result if the progress of science and technology were halted? That question is answered by Dr. Norman E. Borlaug, Nobel Laureate and distinguished professor at Texas A & M University, who wrote the foreword for *Toxic Terror:* ". . . Keep in mind the reality that a world without industrial and agricultural chemicals would be a very different world. Banning chemical fertilizers and pesticides will inevitably lead to deadly serious food shortages; it's as simple as that. Banning other industrial chemicals will likewise impoverish our nation. This is the price the toxic terrorists are asking us to pay."

Toxic Terror is a convincing and persuasive work by a professional who strives for balance and rationality. Much of what Dr. Whelan has written has been revealed before. But that does not lessen the impact of a forthright and level-headed account of what has been going on in our environment, where mistakes have been made, who's accountable, and why we must ask ourselves: What kind of a world do we want to live in?

C. D. Everhart, a former public relations executive, is now a freelance writer.

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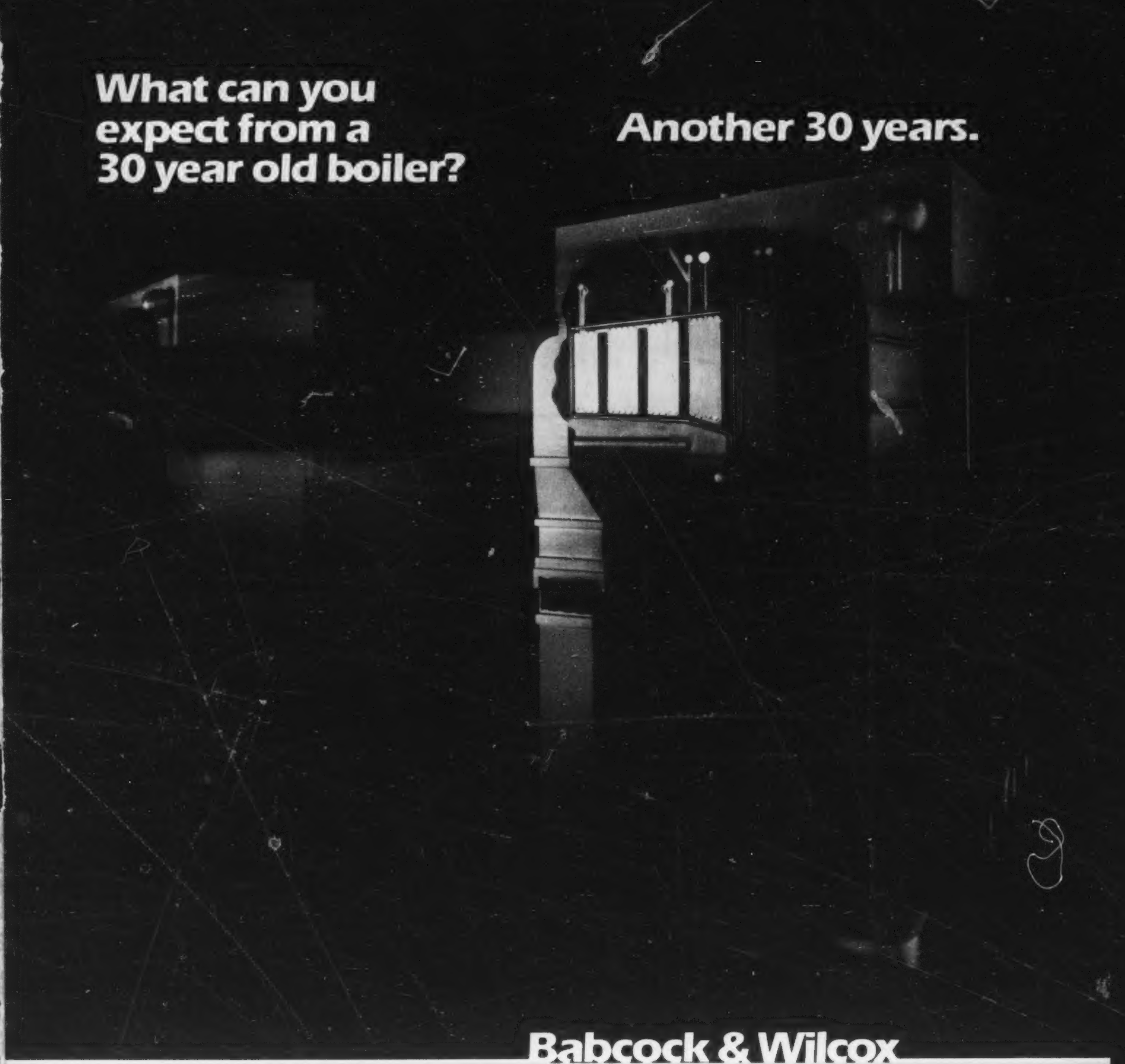

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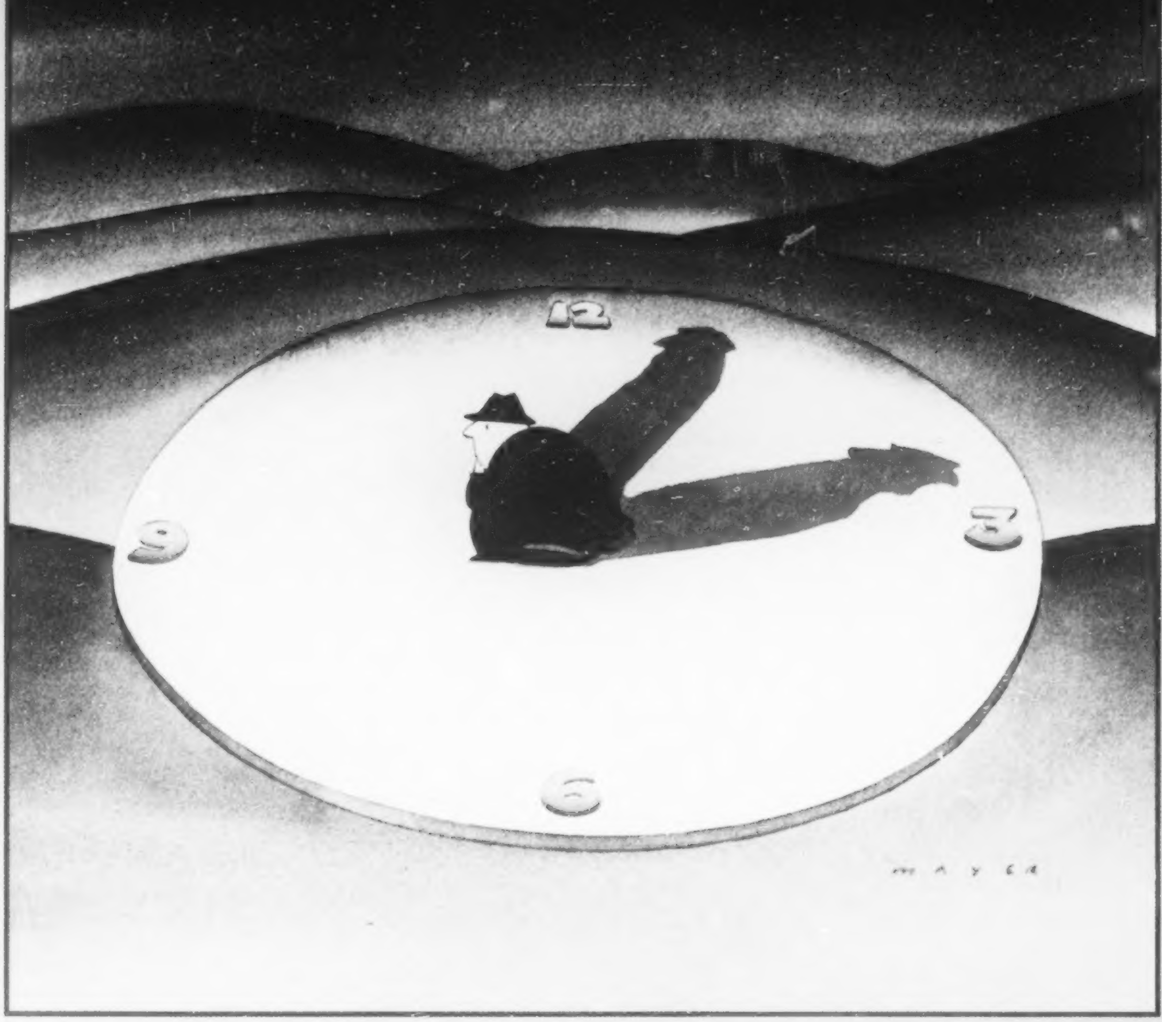

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NOTE

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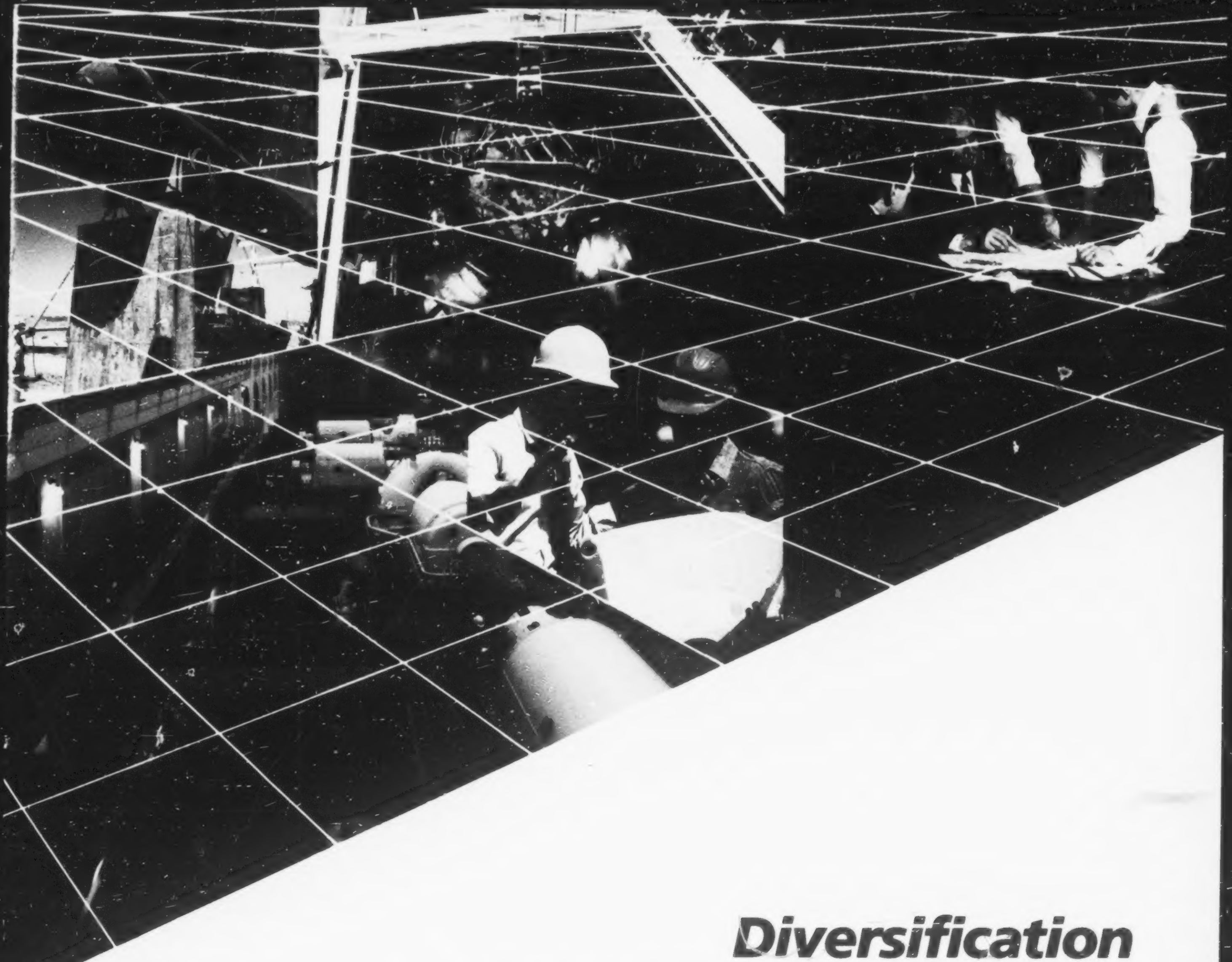

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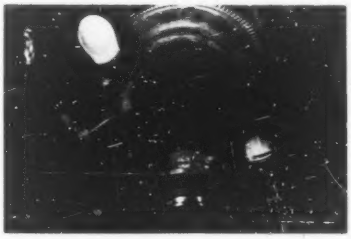

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A PERIODIC REPORT FROM BURNS AND ROE SUMMER, 1986

Burns and Roe helped to restore The Lady With the Torch

Next month, when the Statue of Liberty rededication ceremonies are held during the Statue's 100th anniversary, Burns and Roe can say–with more than a little pride–that we played a role in several important aspects of the restoration.

The key figure in the story is Dr. John A. Tesoro, Burns and Roe's director of corporate information services. In addition to holding a Ph.D. in civil engineering, John is also a specialist in the application of data processing to engineering, finance and computer graphics.

John is active in the American Society of Civil Engineers (ASCE). Early in 1984, John was asked to represent ASCE in the Statue of Liberty restoration.

This led to John's becoming an unpaid consultant to the National Park Service, which is overseeing the restoration. That became the first of Burns and Roe's involvements – the donation of John's time to review bid specifications from suppliers who competed for the 21 major projects involved in the restoration.

That led to Burns and Roe's next involvement – when John Tesoro became the mediator in a dispute over one of the key projects that's been a problem for 100 years: the repair of the Statue's offset shoulder and arm.

The architectural firm and the engineering firm involved in the restoration wanted to replace the shoulder and arm structure with a new design; the National Park Service wanted to repair the existing design by reinforcing existing members and adding new members.

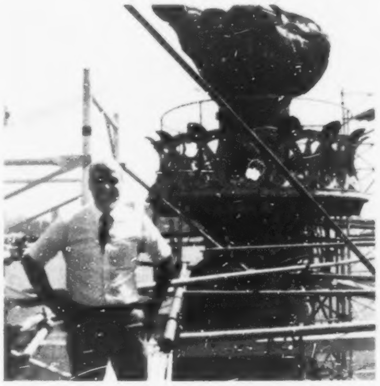
So one summer day in 1984, John found himself in a conference room mediating the dispute among the three parties. After hours of haggling, the Park Service prevailed.

Burns and Roe's next involvement had to do with the use of a computer-aided design and drafting (CADD) system to create new engineering drawings of the Statue; all of the original drawings were lost in a fire in France at the turn of the century.

The project was financed by funds raised by ASCE. Since 1984, Burns and Roe's CADD system has generated some 75 drawings, performing the service virtually at cost as one of its contributions to the restoration.

Five of the key drawings will be converted to ink on mylar and stored in a climate-controlled vault in the Library of Congress. It will be part of a collection of the Historic American Engineering Record, a program run by the U.S. Department of the Interior to document and preserve the key engineering and industrial structures that are part of America's history.

Burns and Roe's final involvement will be visible to all Statue visitors: a computerized exhibit in the Statue's pedestal. The exhibit was designed and implemented by Burns and Roe, using the CADD-generated engineering and design documents to explain the restoration effort to the public. By pressing a button, one of these four stories can be called up on a cathode ray tube: the major restoration activities, the structural components of the Statue, the offset problem involving the Statue's shoulder and arm, and the flexible design of the Statue that allows it to move in heavy winds.



Dr. John A. Tesoro

Burns and Roe's contribution to the restoration has been officially recognized by the Statue of Liberty-Ellis Island Foundation. But John Tesoro's satisfaction is much more personal.

John points out that half of all Americans today are descended from immigrants who came to this country through Ellis Island, where they were welcomed by the Statue of Liberty. Two of those immigrants were John's grandparents who came to America – one from Hungary in 1910 and one from Italy in 1912 – through Ellis Island. Their first view of their new homeland, he says proudly, was of The Lady With the Torch which he, and Burns and Roe, helped to restore.

New projects

Toledo Edison Company has selected Burns and Roe to perform functional plant walkdowns of the systems outside containment at the Davis-Besse Nuclear Power Station. The purpose is to obtain equipment nameplate information and to assure that plant design documentation is consistent with plant configuration. Verification of approximately 50,000 components is involved.

Korea Electric Power Corp., and its engineering subsidiary, Korea Power Engineering Company, have retained Burns and Roe to provide consulting services to Korea Nuclear Units 11 and 12. The initial assignment is to assist in bid evaluation, which will require the assignment of five Burns and Roe supervisors to Seoul.

Burns and Roe has been chosen to provide conceptual design of a Cold Neutron Guide Hall at the National Bureau of Standards' test reactor in Gaithersburg, Maryland.

Safety of high-energy piping systems should be evaluated

In fossil-fired power plants that are more than 15 years old, high-energy piping systems can constitute a serious safety hazard.

At one utility last year, a 30-inch-diameter seam-welded hot reheat pipeline ruptured without warning. One employee was killed instantly; five more died later from their injuries, and 10 others were hospitalized, five of them in critical condition.

The conventional approach to examination of vintage high-energy piping systems – strip off all the insulation and study the entire system – can be extremely expensive.

Burns and Roe has developed an entirely new approach to the problem. It is a combination of engineering principles, economics and common sense.

The main features of Burns and Roe's program are:

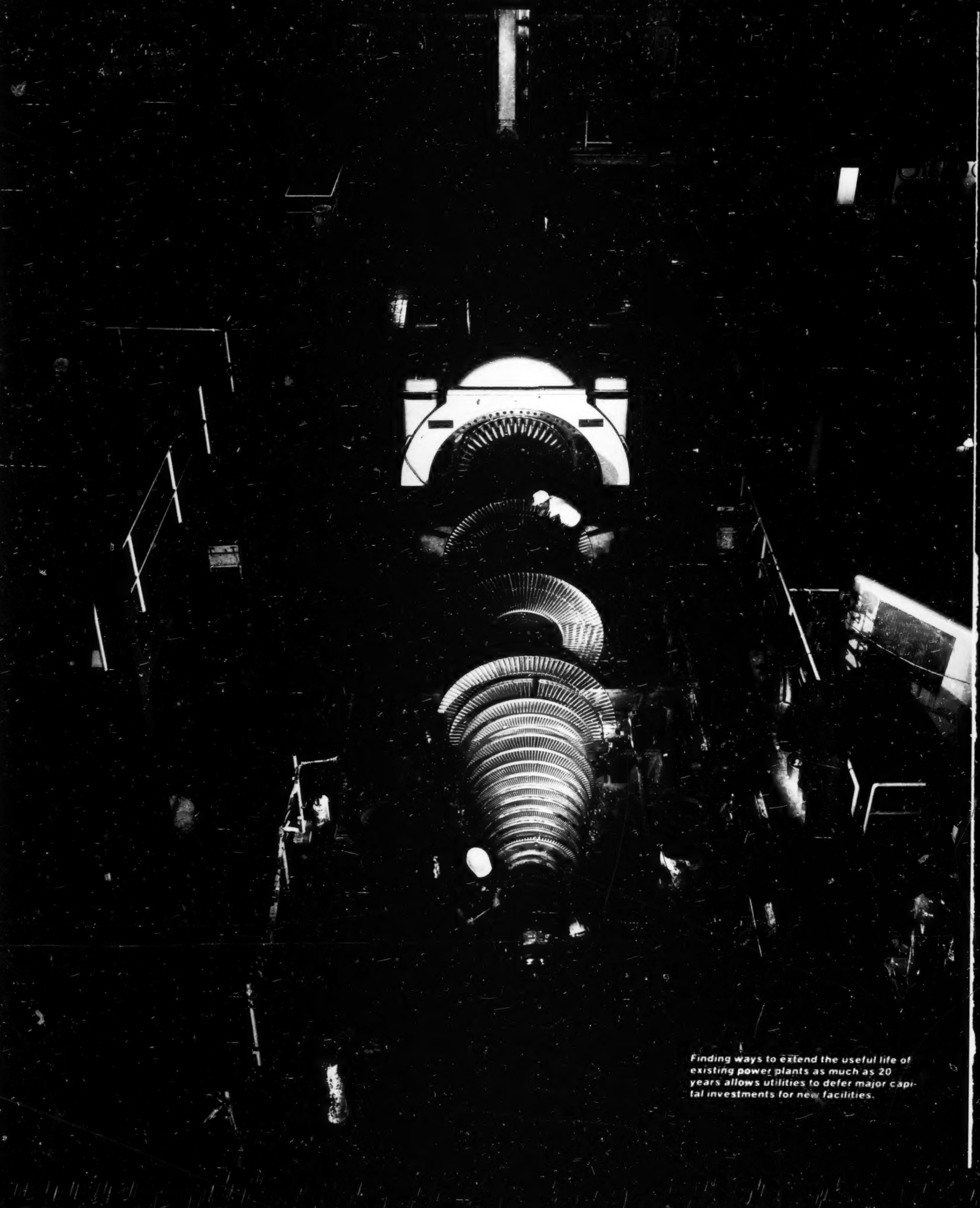
- A review of the piping system design and performance;
- A comparison of original design specifications with current code requirements;
- A non-destructive examination of selected pipe localities considered most critical;
- An acoustic emission screening for critically active defects;
- Correlation of analytical and test results;
- An estimate of remaining piping life;
- Identification of areas of concern;
- Recommended remedial actions, if any;
- Identification of areas to be examined and evaluated in the future.

Burns and Roe recently completed such a project for a southern utility which had had a rupture in a hot reheat line. In addition to most of the above steps, Burns and Roe provided technical support during the repair work as well as supervising the return of the unit to operation.

Two different disciplines are involved in such projects: stress engineering and metallurgical engineering. Burns and Roe has assembled an outstanding team to carry out piping systems inspections and evaluations:

- Dr. Bedros Bedrosian, Burns and Roe's assistant chief civil engineer and manager of piping engineering, who holds a Doctor of Engineering Science degree from Columbia;
- Zdenek Studnicka, principal engineer – piping, who holds M.S. degrees in mechanical engineering from CVUT-Prague University in Czechoslovakia and from Stevens Institute of Technology;
- Harry E. Lunt, corporate consulting engineer for materials engineering, who holds an M.S. degree in physical chemistry and who is a Fellow of both the American Society for Testing and Materials and the American Society for Metals.

If you have a vintage plant and an outage coming up, ask Burns and Roe for an examination of your hot reheat piping.



Finding ways to extend the useful life of existing power plants as much as 20 years allows utilities to defer major capital investments for new facilities.

Least Cost for Whom?

Beware. There's more to motherhood and apple pie than meets the eye.

Electric utility regulators are taking an increasing interest these days in "least-cost planning" or "integrated resource planning," deceptively simple labels for a new regulatory approach with deep but uncertain ramifications.

Several states have already adopted elements of a "least-cost" policy; others are considering it; and Congress recently appropriated funds to encourage this approach. The National Association of Regulatory Utility Commissioners (NARUC) passed resolutions in 1984 endorsing the policy and formed an energy conservation committee that is pursuing the subject.

"There's a tremendous amount of interest and activity among state regulators on integrated least-cost planning," says Edythe J. Gaines, a commissioner on the Connecticut Public Utilities Control Authority and liaison between NARUC's committees on electricity and energy conservation.

"It's a pretty hot topic," Gaines says.

It's also a complex and confused topic.

For one thing, there is no universal agreement on what "least-cost planning" is—or should be. A recent study by the Edison Electric Institute (EEI) found half a dozen different definitions in use. When this topic comes up for discussion, "Define your terms!" is no semantic cop-out; it's the only sensible way to begin.

As state utility commissions move from theory to practice, a basic working definition is emerging, combining elements implied by both labels: "integrated resource" and "least-cost." An "integrated least-cost electric utility resource planning program," then, seeks to provide reliable electric service by all appropriate means at the least possible cost to consumers—giving equal and integrated consideration to energy conservation, non-traditional power generation, and conventional power plants.

Stated that way, it seems simple enough and is widely accepted by the main players in utility regulation: consumer advocates, regulators, and the utility industry itself, which is already taking many of those steps. But the agreement may be only skin-deep.

"On that level, agreement is quite close and it's difficult to argue with the phrase 'least cost,'" says Bruce G. Humphrey, director of economics for EEI, the industry's main trade association. "It's like motherhood and apple pie. But at the very next level down, the issue begins to diverge: least cost for what? And for whom?"

The Path into the Thicket

Humphrey's questions only hint at the rich potential for controversy carried by the concept of "integrated least-cost planning." They are worth coming back to. But first, it's worthwhile asking why utility commissions, which don't willingly jump into bramble patches, are so interested in regulatory least-cost planning policies at all.

The answer is that they see integrated least-cost planning as one way of preparing for shifting economic forces, changing consumer choices, and emerging new technologies on both the supply side and demand side of the utility market. The past decade has been a tumultuous one for electric utilities. Neither regulators nor utilities want to revisit the difficulties of that period.

Freelance writer Stan Benjamin was an Associated Press reporter for 20 years and specialized in energy and environmental issues.

The path that led them into those difficulties began, perhaps, at a milestone marked 1965, the year when a massive power failure, cascading from system to system, briefly blacked out much of the northeastern United States. The costly incident focused attention on the strain that an unexpectedly high growth rate in electricity demand had placed on reserve generating capacity. Facing lead-times of 8 to 14 years, the utility industry found itself scrambling to plan, order, and build new power plants fast enough to keep up with a demand growing at about 7 percent a year and to increase reserve capacity on top of it!

A decade later, however, when these new power plants were well under construction or coming on line, the path was taking a different turn. The long Vietnam war, the Arab oil embargo, and the OPEC oil price increases had contributed to a sharply inflationary economy. Power plant construction costs were soaring, so were interest rates on the money needed to finance them; new environmental protection requirements were adding new costs; and electricity demand growth was collapsing to only 2.5 or 3 percent a year.

Many utilities found themselves burdened with costly new generating capacity becoming available during a period of unexpectedly low demand growth—and asking

Paul Ferrini

state commissions for rate increases to pay for them.

It was clear that electric utilities needed to improve their load forecasting, shorten construction leadtimes, minimize capital investment, and maximize the efficient use of facilities already on their books.

In recent years, they have adopted a wide variety of measures in conservation, load management, and alternative generation sources to bring electricity supply and demand back into balance.

New Options, New Actions

EEI recently surveyed 89 electric utilities nationwide whose kilowatt-hour sales represent 75 percent of the entire electricity market.

"Utilities have considered and are adopting in their resource plans a wide variety of demand-side and supply-side resource options," the survey found; see Table 1 and Table 2. "Increasingly, utility resource plans represent a portfolio of options rather than a concentration on one or a few alternatives."

Specifically, 21 different options for reducing or managing electricity demand and 15 options for supplying electricity (cogeneration was cited by many as both a demand-side and a supply-side option) were at least considered by more than half of the utilities.

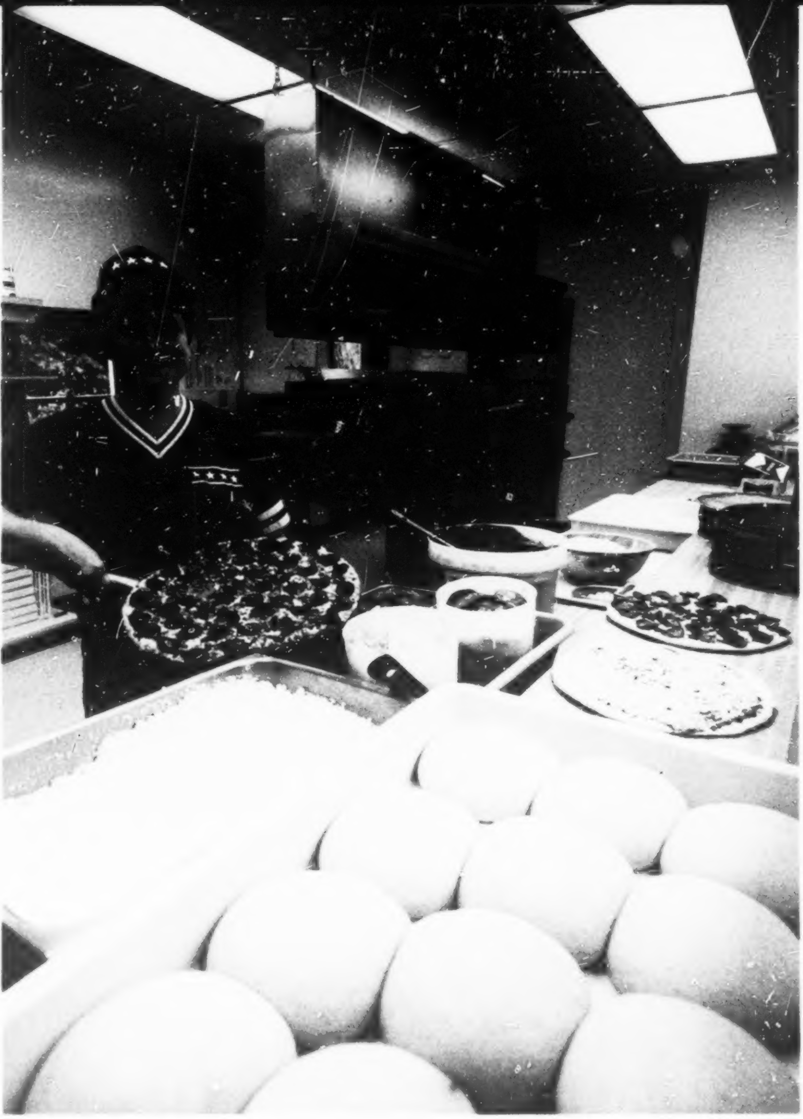
More than half had already adopted programs for residential conservation services and audits, insulation and weatherization programs, commercial and industrial interruptible service, cogeneration, or power purchasing, as well as conventional coal-steam power generation.

More than 40 percent had adopted a wide range of other programs: commercial and government conservation services and audits, heat pumps, efficient water heating, efficient appliances, efficient lighting, efficient air conditioning, industrial conservation services and audits, industrial time-of-use rates, commercial and governmental time-of-use rates, economic development programs, and plant life extensions.

The most widely cited basis for selecting demand and supply options was cost-effectiveness, the survey found.

In a very real sense, then, the utility industry is already practicing "least-cost planning" in a remarkable variety of ways, in response to its changing circumstances.

Many companies are already doing it, says Gaines of NARUC.



American Electric Power Service Corporation

Commercial establishments can cut costs by using high-efficiency electric appliances, like this pizza oven.

"The utilities themselves have caught on to it, in their own best interests."

That point is acknowledged even by Paul Markowitz, policy analyst for the Critical Mass Energy Project, a consumer advocate organization openly opposed to power plant construction and strongly promoting "least-cost planning."

"They are doing it to some extent, yes," Markowitz says. But he thinks electric utilities could and should be doing more.

Markowitz believes utilities must be required by state regulation to practice least-cost planning because, he contends, they have tax

Table 1

Demand-Side Options in Utility Planning

Category	Options	Number of Utilities Responding: 89 Initially Considered	 Included in Plan
Conservation	Residential Conservation Services/Audits	68	55
	Insulation/Weatherization	67	48
	Heat Pump	64	42
	Commercial/Government Conservation Services/Audits	62	44
	Efficient Water Heating	62	43
	Efficient Appliances	60	37
	Efficient Lighting	60	44
	Efficient Air Conditioning	59	40
	Industrial Conservation Services/Audits	54	36
	Solar Heating	46	16
Load Management	Water Heater Interruption	68	30
	Commercial/Industrial Interruptible	66	52
	A/C Cycling	65	26
	Thermal Energy Storage	48	21
	Irrigation Pumping Interruption	33	13
	Other	25	18
Time-of-Use Rates	Industrial	65	43
	Commercial/Government	60	39
	Residential	60	30
Renewables	Wind Energy	48	16
	Solar Electric	44	11
Industrial	Industrial Development Rate	37	19
	Industrial Electrification Program	25	14
Other	Cogeneration	74	46
	Economic Development Program	49	37
	Other	23	10

Source: *Electric Utility Resource Planning Survey* (Final Draft Report), Edison Electric Institute, March 1986

and rate-of-return incentives to keep on building large, high-cost power plants instead. Those are old arguments, firmly rejected by the utility industry.

"We disagree," retorts Humphrey. "As a matter of fact, the situation is probably just the reverse. Under current conditions, selecting a large generating facility is the option of last resort."

The utility industry, he says, gets no unusual tax advantages, and, in any case, taxation is explicitly taken into account by regulators determining the cost of service, including a utility's allowed rate of return.

The other argument, known as the "Averch-Johnson hypothesis," suggests that granting utilities a return on invested capital encourages them to maximize capital investment. That may have made some sense when it was proposed in the early 1960s, Humphrey says, but high construction costs, high interest rates, and the risks associated with cost recovery have reversed that logic in recent years.

"Utilities, for a time, were not recovering their cost of capital. Now the incentive is not to build," he says. Humphrey recognizes, however, that if the recent fall in fuel prices, inflation, and interest rates persists, power plant construction could regain some favor, at the expense of alternative measures.

"Certainly as energy prices come down, there's less incentive for consumers to undertake demand-side activities," he says. "The decision to build will be driven by growth in demand."

So the question remains open enough to stimulate continued concern among consumer advocates and utility regulators.

Utility commissioners certainly want to avoid any repetition of the construction cycle recently completed, with its cost overruns, prudency investigations, rate increases, and wrangling over allowing equipment in rate bases.

"It was a nightmare," says Gaines. "Commissioners don't want to go through that again, and common sense tells you that neither do the utilities nor their shareholders."

Indeed they don't, which is one reason the utility industry, too, is taking a more than passing interest in the integrated least-cost planning approach.

A. W. Dahlberg III, president of Southern Company Services, Inc., testifying before Congress last year on behalf of EEI, emphasized those points. "One of the concerns often expressed about utility planning," he said, "is the fear by those not familiar with the process that utilities have great incentives to build new capital-intensive plants. I assure you this is not the case. Since the mid-1970s, ratemaking proceedings have been difficult and agonizing for utility management."

And Dahlberg added: "Our present regulatory and economic environment provides numerous incentives to choose the least-cost strategies and significant penalties for failure to do so."

Gaines says integrated least-cost planning may offer a way "to deliver excellent quality energy to the consumer at minimum costs and with great efficiency, relieving the sources of the past conflicts."

Table 2

Supply-Side Options in Utility Planning

Category	Options	Number of Utilities Responding: 89 Initially Considered	Included in Plan
Baseload	Coal-Steam	86	66
	Fluidized Bed Combustion	69	6
	Plant Life Extension	66	34
	Gasification/Combined Cycle	60	6
	Nuclear	51	17
Intermediate/Peaking	Oil/Gas Combustion Turbine	74	33
	Plant Life Extension	70	39
	Oil/Gas Combined Cycle	61	12
	Pumped Storage	53	12
	Fuel Cells	51	3
	Oil/Gas-Steam	37	8
Renewables	Solid Waste-Steam	58	15
	Wind Power	48	10
	Solar Photovoltaic	39	5
	Solar Central Receiver	30	1
	Geothermal	28	5
Other	Purchased Power	83	54
	Cogeneration	69	38
	Small Power/Small Hydro	11	5

Note: Increments to supply after 1985

Source: *Electric Utility Resource Planning Survey* (Final Draft Report), Edison Electric Institute, March 1986

Electric Power Research Institute

Utilities are helping basic industries, such as steel and metals fabrication, to stay competitive in world markets through discount rates and through development of new electricity-based technologies that can improve industrial capacity, process control, and product quality at lower cost.

Least Cost for Whom?

Establishing an integrated least-cost planning program, however, means resolving less obvious conflicts, for "least-cost planning" means different things to different people. "Least cost for what and for whom?" as Humphrey puts it.

"A utility's investment decision is not only under the purview of the state utility commission, but it also has to meet the requirements of the financial community," he points out. "The money comes from the investors, which gets back to the question of least cost for whom."

Opinions and definitions vary on that point: least cost to ratepayers; to ratepayers and utility investors; to society as a whole; to future generations and their environmental and resource heritage?

If least cost to ratepayers is the answer, as it often is, the question can still arise: which ratepayers? Should the money saved by a utility-sponsored home insulation program be kept by those whose homes are insulated? Or should it be shared among all utility customers, including those who don't bother to insulate? Should the savings gained by industrial efficiency improvements be shared with residential ratepayers?

What dollar values should be assigned to the relative service reliability of, say, steam-electric generation versus solar cells and wind turbines, in a "least-cost" comparison? What kind of service, in short, should consumers pay the least cost for?

The answers to such questions depend on the underlying philosophies of the debaters, and that's where much of the present confusion over "least-cost planning" comes from.

The origins of the concept are often attributed to the writings of Amory B. Lovins and Roger W. Sant in the late 1970s—creating an element of confusion right from the start. In fact, the energy policies advocated by Lovins and Sant had little in common with each other or with integrated least-cost planning as it is practiced and preached today.

In his 1977 book *Soft Energy Paths*, Lovins, an environmentalist with Friends of the Earth at the time, argued quite frankly that energy choices should be governed by a social and political agenda designed to eliminate "centrism, vulnerability, technocracy, repression, alienation," and other supposed evils.

"We are more endangered by too much energy too soon than by too little too late, for we understand too little the wise use of power," Lovins wrote.

He suggested that "the energy system that seems socially more attractive is also cheaper and easier," but this was a fringe benefit, not his guiding principle. In fact, Lovins recommended inverting utility rate structures (charging the biggest users the highest rates instead of offering them volume discounts) and imposing a tax of $20 to $30 a barrel on oil whose revenues "could be used redistributively, for example, to finance a minimum income. . . ." Whatever its merits, this was not a program aimed at minimizing the cost of energy to its consumers.

Sant, as director of the Energy Productivity Center of the Mellon Institute and a former energy conservation official in the Ford administration, introduced *The Least-Cost Energy Strategy* in a booklet under that title in 1979. Sant's strategy, quite simply, proposed to deregulate all energy facilities except transmission lines and pipelines and to let consumers choose their energy services in an otherwise free market. Energy services at the lowest cost to the consumer were the aim, defined in narrow economic terms as life-cycle "fuel, capital, and other operating costs."

Clearly, Sant's free-market decision machine was a far cry from Lovins' socially-planned "energy soft path" (which Sant in fact dismissed as one of several "tactical diversions" from the real energy issue).

Not-So-Hidden Agendas

Integrated least-cost utility planning, in today's meaning of the term, is neither a deregulated free market in energy (Sant) nor a political/social reform program (Lovins). It has, however, inherited some points taken out of context from both Sant and Lovins, and those links with the past contribute to the present confusion.

From Sant came the observation that people don't want or need energy for its own sake but rather for the services and benefits they derive from it. If they can buy the same degree of services and benefits more cheaply, with less energy, Sant said, let them. In today's least-cost policy discussions, this idea is reconstructed to contend that people don't want electricity but electrical services and benefits and that electric utilities have the duty to provide these things. From deregulated consumer-choice to regulated utility-duty, Sant's original theme has been turned upside down.

Sant also contributed the "least-cost" part of the phrase, but somewhere along the line his (free-market) "strategy" was turned into (state-enforced) "planning!"

Lovins' contribution has been—on the surface—mainly a heightened awareness of the contributions that conservation and "alternative-energy" sources can make to the balance of energy (or electricity) supply and demand.

Beneath the surface, however, Lovins' social agenda has been hitched to the economic concept of "least-cost planning" by some consumer advocates.

Those undercurrents and agendas worry Humphrey when "integrated least-cost planning" is brought up. Humphrey expresses concern that the concept, reasonable in itself, may be used to inject into the regulatory process issues that really belong in the political arena, if they belong anywhere.

And the word "cost" may be the needle making this injection: if electricity services and benefits are to be provided at least cost, then what must be included in the costs that are compared?

Markowitz claims that the full environmental and social costs of large-scale power plants—nuclear or coal—are not reflected in the price of electricity to the consumer.

Humphrey responds that social and environmental costs certainly are reflected in electricity prices, to exactly the degree that society wants them to be.

"The government has caused these costs to be internalized," he says. "Coal emissions are now scrubbed. Moneys are collected by the federal government for storage and treatment of nuclear wastes. Nuclear plant decommissioning costs are often in the rates. These items are explicitly considered in industry planning and accounting and in government regulations."

Right:
For proven, reliable baseload in the foreseeable future, utility resource planners will still count on coal-steam plants as their primary workhorses.

Below, right:
Integrated gasification combined cycle technology, as demonstrated at the Cool Water power plant in southern California, is on several utilities' lists as a promising supply-side option.

In that view, the argument that additional "social" costs should be charged against power plants in a least-cost planning comparison is something like asking the police to impose a fine, although the court has found no violation: where a legislature has refused to assess a social cost, it seems to imply, a regulatory commission should ignore the decision and impose such as assessment anyway.

It's no secret, as Markowitz points out, that the Critical Mass Energy Project opposes construction primarily of nuclear power plants, but also of coal-fired plants.

"And to that extent," Markowitz says, "we look at least cost as a possible mechanism for making sure new power plants aren't being built. It's not a hidden agenda."

Humphrey worries that such agendas may warp the least-cost concept and process into an unjustified prejudice against power plants.

The North American Electric Reliability Council (NERC) has projected a growth in kilowatt-hour electricity demand averaging 2.4 percent a year to 1994. EEI reported in 1985 that 151 new generating facilities were scheduled by 1994, totaling nearly 85,600 megawatts—over 93 percent of it from nuclear and coal-fired plants.

But NERC also noted that the scheduled increases in generating capacity would average only 1.65 percent a year or less, falling be-

Joe Mahoney, Virginia Power

Southern California Edison

hind the projected 2.4 percent demand growth.

"There should be little doubt that new capacity is needed for the 1990s and beyond," EEI chairman Sherwood H. Smith, Jr., told Congress last year.

If least-cost planning is distorted from a useful planning tool into an anti-utility weapon, Humphrey warns, "the danger is that when a new power plant is indeed needed, building it will be so politically difficult that it won't be done in a timely fashion, and the result will be unnecessarily high electricity costs and the danger of less reliable or inadequate supplies."

Diverse Attitudes and Policies

Humphrey emphasizes, however, that EEI has not adopted a policy for or against integrated least-cost planning, and that attitudes toward it vary from company to company, depending on local circumstances.

"I don't think there is a uniform attitude," he says. "The industry is very diverse."

So are the regulatory policies of the various states.

A survey presented by Markowitz late last year identified 11 states that required electric utility investments to conform to a long-term, integrated least-cost plan: California, Illinois, Indiana, Maine, Massachusetts, Nevada, New Hampshire, Oregon, Texas, Vermont, and Wisconsin.

Another 16 states were reported to have elements of such a planning process but not to link construction licenses with least-cost planning. They were Arkansas, Connecticut, Florida, Idaho, Iowa, Maryland, Minnesota, Missouri, Montana, New Jersey, New Mexico, New York, North Carolina, Ohio, South Carolina, and Virginia.

Other states had taken few steps, if any, in the direction of integrated least-cost planning; Michigan, however, has begun a comprehensive "Michigan Electricity Options Study" (MEOS) with the participation of more than 90 organizations including the state's electric utilities. Final reports are targeted for mid-1987.

Federal involvement with least-cost planning has been minimal—and all sides seem to agree that's what it should be.

The Federal Energy Regulatory Commission (FERC) adopted Order No. 298, in 1983, requiring certain utilities to submit a least-cost justification when seek-

Pacific Gas and Electric Company

Encouraging homeowners to insulate can make a difference in a company's capacity needs.

ing inclusion of construction work in progress (CWIP) in their rate bases.

Last year, at the urging of Representative Claudine Schneider (R-Rhode Island), Congress appropriated about $950,000 to the U.S. Department of Energy for fiscal 1986 to aid utilities and state utility commissions in integrated least-cost planning programs. The Department invited suggestions, and NARUC has proposed creation of a computer-accessible data bank through which state utility commissions could find out what kind of conservation and alternative-energy programs are tried throughout the country and how well they work.

"One of the basic goals of the program is to help spread greater certainty about the potential and achievements of demand-side programs," says John P. Millhone, director of DOE's Office of Building and Community Systems.

As directed by Congress, DOE has been consulting with EEI, the Electric Power Research Institute (EPRI), NARUC, and other interested parties on the best ways to apply the funding.

Among existing state least-cost planning programs, one of the most complete was adopted in 1983 in Nevada, where it's called "integrated resource planning." The state's two electric utilities—Nevada Power Company and Sierra Pacific Power Company—were required to submit action plans every two years, starting July 1, 1984.

Experience: Some Pain, Some Gain

The Nevada experience so far seems to indicate that if integrated least-cost planning is applied fairly and as intended, its disadvantages to electric utilities may be moderate and may be offset to some extent by new advantages.

But the program is not entirely friction-free.

"We have workshops with the utilities on a monthly basis," explains Jon B. Wellinghoff, head of the Nevada Consumer Advocate Office. "At the mid-management level, anyway, we are coming to basic agreements at least on the technical aspects of what needs to be done for resource planning.

"At the senior level, I think we still have some fundamental disagreements, primarily on the speed and penetration level at which various demand-side measures can be implemented out in the market."

Wellinghoff says his office thinks demand-side measures can be accelerated, while the utilities "are taking a very reasonable but still a cautious, conservative approach."

Wellinghoff believes a data base for information exchange would help to resolve the uncertainties that dictate this caution.

Wisconsin Electric Power Company

Load control receivers let a power company directly control electric water heaters and other appliances. Wisconsin Electric is field-testing these load management devices with 100,000 customers.

"We need a method for our utilities, and probably most utilities in the country, to plug into some kind of central data base and see what's been done in other places and how fast things could be implemented," he says.

Of course, a necessary next step,

Boston Edison Company

Energy audits in homes and businesses are the starting place for effective conservation programs.

he adds, would have to be local testing to find out whether a program that worked elsewhere can be applied successfully under each utility's own specific conditions.

Frank Loudon, manager of resource planning for Nevada Power, says the state's resource planning regulation, General Order 43, has not forced any drastic changes so far.

"Most of what was required in the General Order we were already doing," Loudon says. "I guess the biggest difference is that we have to do it in a more formal manner now and file it more formally with the Public Service Commission."

The new planning requirements, he reports, have been costing the company about one million dollars a year. The Nevada regulations, however, allow the utilities to recover their planning costs.

"One basic change that it did require is in the method of developing a load forecast," Loudon says. "Before, the forecasts were based largely on econometrics—projected population, employment, and so on. Now we are required to do an end-use load forecast."

That means analyzing electricity demand by consumer sectors and applications, right down to such end-use devices as lights and air conditioners, and then forecasting trends in their use and efficiency.

The commitment to a two-year plan also reduces flexibility in responding to unexpected events, Loudon says, and the company has been discussing with the state commission the possibility of amending plans in mid-cycle.

Ralph Caldwell, manager of resource planning for Sierra Pacific, says the new Nevada regulations prompted his company to broaden its consideration of options and to give equal weight to supply-side and demand-side alternatives.

"The advantages to the company," he says, "are not all that obvious." But there are some.

One is the recovery of planning costs.

Another, he points out, is the Nevada regulation's recognition that "we're going to be doing things we haven't done before, and we may fail. And if we do, those costs should be regarded as research and development costs and should not be disallowed. So, in exploring new options, we're protected as far as our costs go."

"Another potential advantage is that we should end up with a longer shopping list of ways to meet load, including a lot of ways without investing our capital, should we choose not to," Caldwell says, adding that this may give management increased flexibility in making decisions.

Still another benefit, he says, has been "a substantial improvement in the level of understanding on the part of the [state] Consumer Advocate of the process that we go through. Part of the process has required them to get smarter, just as we have."

"It doesn't come without pain, of course," Caldwell continues. Compliance with the regulations takes a lot more staff time, for instance. "What it means is, you work many extra hours. And the resource planning staff, over the past three years, has grown from 4 to 14."

Nevada's program has also been interpreted to require energy efficiency improvements throughout the company's own operations, he adds. "That's actually healthy in the long run, but it's extremely difficult to implement very quickly."

Some of that pain-of-compliance should ease, Caldwell thinks, as initial changes are accomplished and new procedures are mastered. That should begin happening, he estimates, "by the third filing, perhaps"—that is, with the third two-year plan, due in 1988.

Meanwhile, the "pain," Loudon agrees, is not really unbearable.

Integrated least-cost resource planning, at least in the Nevada version, causes "a lot of inconvenience," Loudon remarks. "It makes your planning process less flexible. It can cause you a little grief. But other than that, no, I don't think there are any real major problems."

Says EEI's Humphrey: "Utility planning should be integrated so that supply-side options and demand-side options are considered together, and their selection should be based on economic grounds.

"If you accept the term 'least-cost planning' as meaning integrated consideration of both supply- and demand-side options, then we're reasonably comfortable with it."

"There's really no general feeling about the Nevada regulations themselves," Humphrey says. "But I think there is a strong feeling that the industry must understand the demand side as well as it understands the supply side and must seize opportunities on both sides of the market.

"The situation," he repeats, "is going to vary from company to company." ESP

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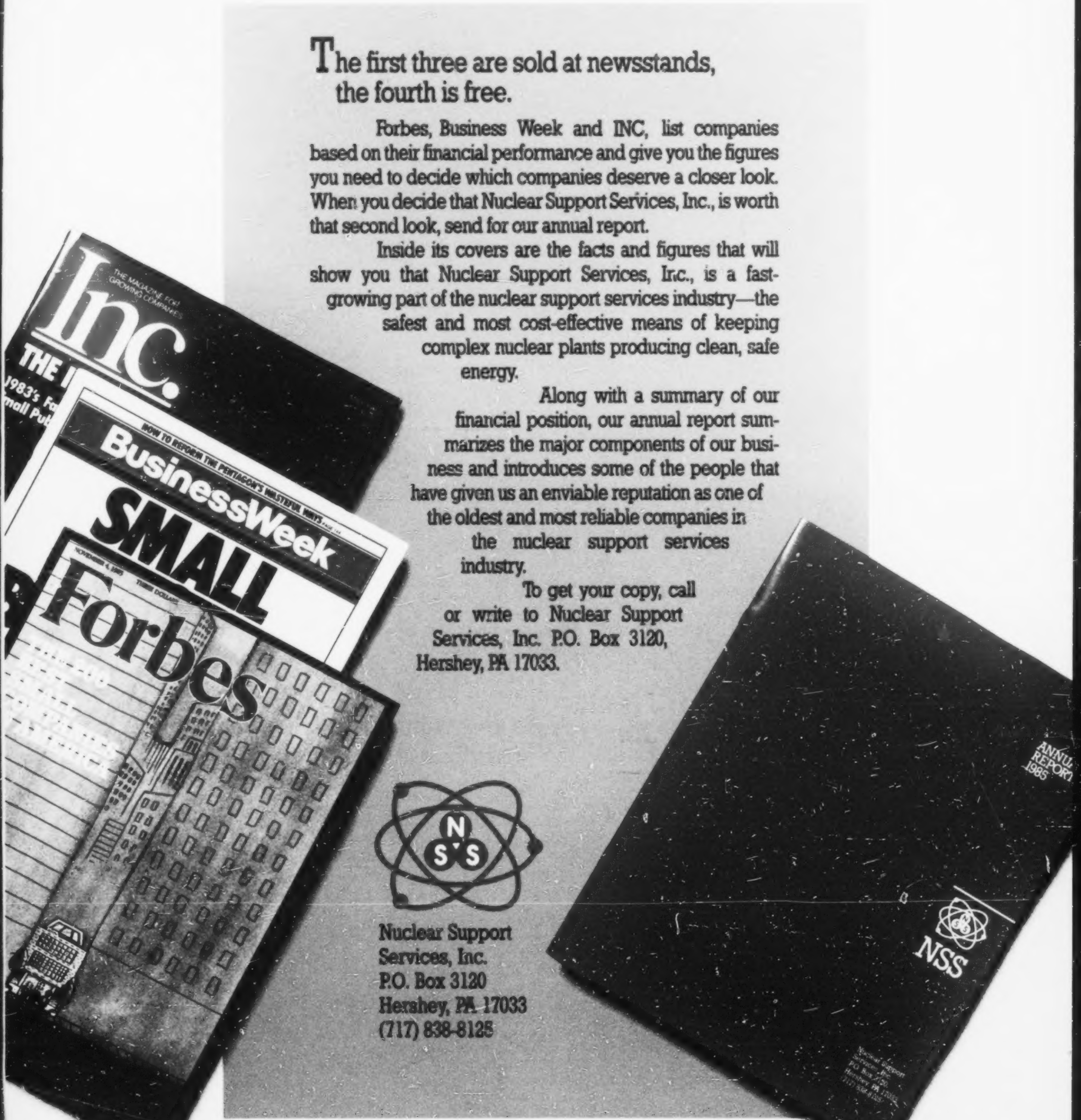
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Gene Pokorny and James Murphy

Why You Need Satisfied Customers

One day soon, the residential market may have other choices of power supply.

Deregulation and competition are coming to the electric utility marketplace. This fact has increasingly been the focus of scores of industry conferences, workshops, and meetings held in the last few years. From all sides, utility executives and managers are being told to reorganize and get ready for a competitive battle for customers' business and loyalty.

The competitive battle is most visibly taking place for the industrial and commercial customer classes. But it is beginning for residential customers too, and this trend will in all probability accelerate in the next few years.

One of the first steps an electric utility must take if it wants to prepare itself for increased competition among energy suppliers for the residential market is to fully understand its customers. The wants, needs, preferences, and expectations that customers have about electricity and the companies that provide it is essential information that utility managers need if they want to develop and implement programs to keep and improve their customers' support and loyalty. While most residential customers today cannot yet pick their electric company, utility managers should act as if they could and strive to become their customers' "preferred supplier."

Understanding residential customers was the main objective of the Residential Customer Market Segmentation Study, completed in 1985 by Cambridge Reports for the Edison Electric Institute. Specifically, we explored the views that customers have on electricity and electric companies in hopes of gaining insights that would help improve the marketing, customer relations, communications, and other activities of the electric utility industry.

Three Things We Learned

Fourteen hundred conversations with individual customers were the foundation for the Residential Customer Market Segmentation Study. The study was based on two nationwide consumer opinion surveys conducted by Cambridge Reports. The first survey, conducted from January 10 to 18, 1985, consisted of telephone interviews with 1,000 people selected to represent the adult American population. The second survey conducted from February 25 to March 19, 1985, consisted of in-person interviews with 400 people, also selected to represent the adult American population.

Three insights emerge from all the data:

The first insight is that today's residential customers think about their electric company in two discrete and separate ways. On the one hand, customers see their company as a product institution. They have a set of opinions, attitudes, and beliefs about the product they buy—electricity—and its cost, its value to them, and their ability to control their usage of it and thus the size of their electric bills.

On the other hand, customers think about their company as a service institution. They have a set of opinions, attitudes, and beliefs about the kind of service provided to them and about the extent to which their company is concerned and cares about them and their interests.

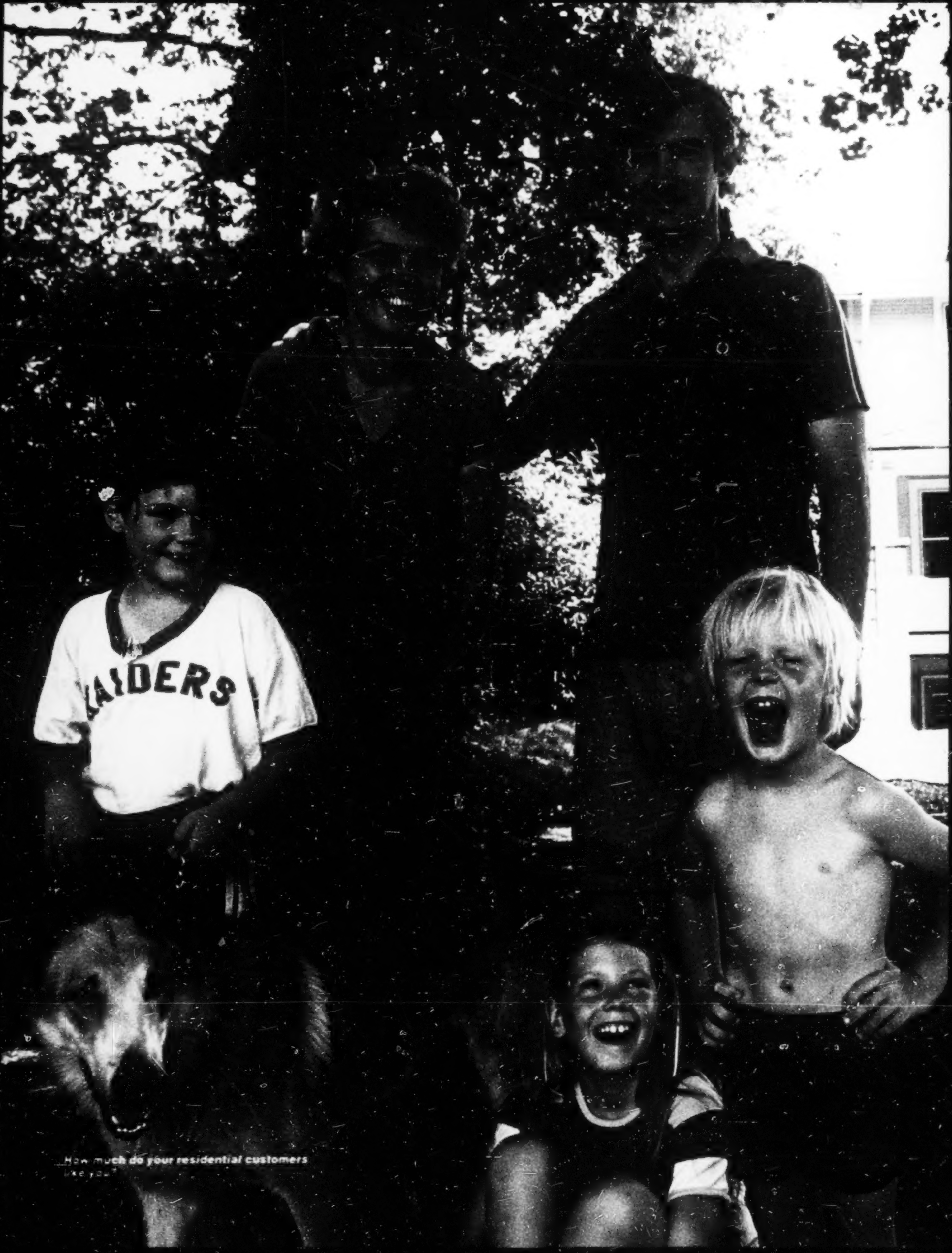
It is critical to understand what customers mean by service. They are not talking about reliability of service alone. In addition to reliability, what customers mean by service is the whole range of interactions and relationships they have with the company and its employees. For example, service includes whether the company provides information and options to help customers use electricity wisely, whether the company takes an interest in the views of customers, whether the company works with customers to develop programs that benefit both, and whether the company shows courtesy and consideration for customers and their problems. It is from these interactions that they judge whether or not their company really cares about them, values their business, and respects them as people.

The second insight is that customers' evaluations of their electric company both as a product institution and a service or concerned and caring institution are statistically equally important influences that explain their final judgments of the company. These judgments include overall favorability, the fairness of electric rates, and the extent to which customers feel they can control their bills.

In customer surveys, we ask

Gene Pokorny and James Murphy are principals of Cambridge Reports, Inc., in Cambridge, Massachusetts.

Max Hirshfeld, Foto, Inc.


How much do your residential customers
like you?

Michael Philip Manheim: Foto Inc

People with low electric bills feel they have more personal control over their costs, while people with high bills feel just the opposite.

questions like: "Do you have a generally favorable or unfavorable opinion of your electric company?" . . . "Do you think your electric rates are too high, fair, or too low?" . . . "Do you personally feel you have control over the size of your monthly electric bill?" We discovered that customers' answers to these kinds of questions are determined as much by how they evaluate their electric company's general concern and caring as by how they evaluate the product—electricity—and the price they pay for it.

The third insight, which is closely related to the second, was uncovered through a special procedure called conjoint analysis. We found that customers' positive perceptions of their electric company as an institution that is concerned and honestly cares about them and their problems will actually offset negative perceptions about the product and its price. That is, a kind of trade-off takes place in customers' minds.

Customers may not be aware that they make this trade-off. Nonetheless, it was clear that they are, in a sense, more likely to tolerate or overlook negative perceptions about electricity and what it costs if they believe that their electric company cares about them as people.

What They Think About Electricity

Let's delve a little deeper.

Early in our national telephone survey, we asked each respondent whether he or she agreed or disagreed with 28 statements about electricity and electricity usage. Through the statistical technique of factor analysis, we discovered that most of the responses to these statements are strongly correlated with one of six underlying dimensions.

These dimensions are:

1. Perceptions of the value of electricity,
2. Perceived choice over electricity usage,
3. Perceptions of electricity's cost and the billpayer's control over costs,
4. Receptivity to demand-side options,
5. Perceived future needs for electricity, and
6. Importance of electricity issues.

Table 1 presents some key statements that make up these dimensions.

It is worth highlighting the third dimension above. In the abstract, perceptions of electricity's cost and one's control over it are conceptually distinct. But, in the minds of customers, they are so closely linked that they fuse into one dimension or factor. That is, customers' feelings about their electricity rates are strongly related to and influenced by their sense of personal control over their electric bill.

On each of the six dimensions, we divided residential customers into groups or segments that gave responses in the low, moderate, and high ranges. On the first dimension—perceptions of value—we find 6 percent of the customers say electricity is a poor value, 42 percent say it is a fair value, and fully 52 percent say it is a good value. Demographically, the unemployed, those aged 18-25, and those with average monthly electric bills of $126 or more tend to rate electricity as a fair value over a good or poor value. All other demographic segments are either evenly divided or show larger numbers rating electricity as a good value than a poor or fair value. Perception of electricity as a good value, however, rises in inverse proportion to the size of customers' monthly electric bills. Finally, appreciation of electricity's value is highest among customers 56 years old and over.

On the second dimension—perceived choice over electricity usage—8 percent of the customers say they exercise little choice over the amount of electricity they use in their homes, 37 percent feel they exercise moderate choice, and 55 percent feel they have a high degree of choice over when and how they use electricity. Pluralities, and in most cases majorities, of all demographic segments score high on this dimension. But the perception of a high degree of choice over time of use and the decision to use electricity is greater among those with lower average monthly electric bills.

On the third dimension—perceptions of costs and control over these costs—we find that 26 percent of the customers feel they have a low degree of control over their electric bills and have high bills, 48 percent feel they have moderate control and moderate bills, and 26 percent feel they have a high degree of control over their electric bills and have low costs. Demographic breakdowns show that men are more likely than women to feel in control of their electricity costs. Feelings of control are higher among customers with more education and among those with lower electricity bills. Perceptions of low control are marginally greater among low-income earners.

On the dimension of receptivity to demand-side options, 12 percent have low interest and 36 percent have moderate interest. Over half —52 percent—are highly receptive; interestingly, all demographic groups agreed.

Table 1

Statements Behind the Six Underlying Dimensions

Value of electricity
Electricity is a good value for the money in terms of the comforts and conveniences it makes possible.
Electricity prices are reasonably fair compared to the cost of most other things today.
Electricity is a good value for the money when you think about what it contributes to our economic and social well-being.
Electricity is a good value in relation to the cost of the appliances it runs.
Choice over electricity usage
People have a choice over how much electricity they use in their homes.
People have a choice over when and what times they use electricity in their homes.
Costs/control over electricity's cost
Paying the electricity bill creates a hardship on my budget.
No matter what I do, I can't seem to make a dent in the size of my electricity bill.
The cost of electricity has risen faster than the cost of other products and services I buy.
Even when I'm away from home a long time, my electricity bill is just as high as when I'm at home.
The cost of electricity is unreasonably high.
Receptiveness to demand-side options
I would change the time of day I use certain appliances if, in return, I was charged a lower rate for all the electricity I use.
I would pay more for electricity during peak demand if I could pay less during other times.
Future needs for electricity
I'll have a greater personal need for electricity ten years from now.
There will be a greater national need for electricity ten years from now.
Importance of electricity issues
I don't really think about the cost of electricity very much.
I'll keep my house as warm as I like in the winter and as cool as I like in the summer.
I don't think about electricity very much; it's just there at my fingertips.
I'm entitled to electricity and shouldn't have to worry about its usage or cost.

Turning to customers' views about America's needs for electricity in the future, we find that 10 percent believe future needs will be low, 46 percent estimate moderate needs, and 44 percent estimate high needs. Customers who rent their homes are somewhat more likely than those who own them to see high future needs. Perception of high future electricity needs is greater among respondents with monthly electric bills of $45 or less than among those with higher bills. Perception of greater future electricity needs is also somewhat higher among the less educated.

Finally, when we look at the extent to which customers say electricity issues are important to them, we find 8 percent who say these issues are of little personal importance or relevance, 49 percent think these issues are of moderate importance, and 43 percent say these kinds of concerns are of high personal importance. Perception of high relevance increases with the size of the customer's average monthly electric bill and is greater among those between the ages of 36 and 55.

The overall percentages in the three segments on each of these six dimensions clearly reveal that residential customers place a high value on the product electricity and feel they exercise choice in its use. On the other hand, while an overwhelming majority expresses either moderate or high interest in demand-side options, only a quarter feel they currently exercise a great deal of control over their bills. Indeed, virtually three out of four customers feel they have only little or a moderate amount of control over their electric bills.

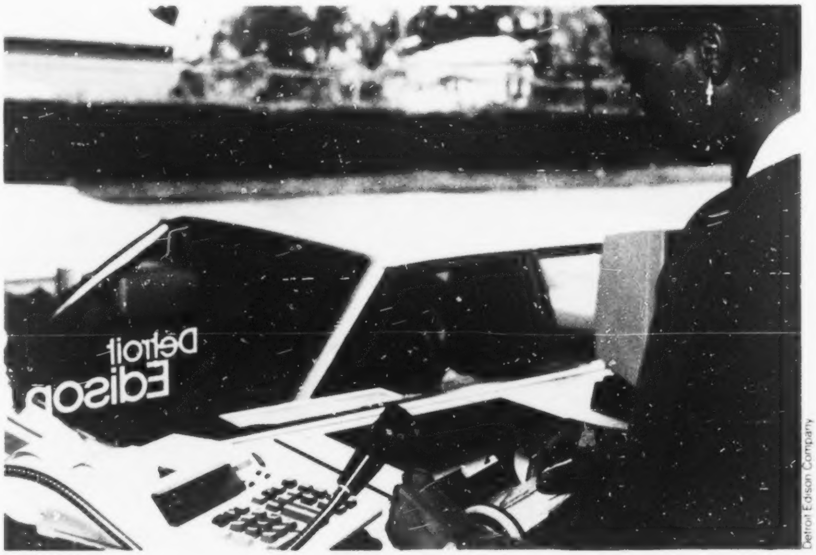
What They Think About Electric Companies

To explore residential customers' opinions about their electric companies, we read to each person an additional 24 statements and again asked whether he or she agreed or disagreed with each one. A factor analysis of the responses revealed that customers think about their companies along four fundamental dimensions.

These dimensions are:

1. Perceptions of company concern and caring for customers,
2. Perceptions of reliability of service,
3. Perceptions of management competence, and
4. Perceptions of the electric com-

Teresa Zabala/Uniphoto



Detroit Edison Company

Above, right:
If they think you honestly care about them, they may tolerate rising prices.

Right:
"Service" means many things to customers, including whether or not your employees are courteous to them.

pany as a monopoly that can take customers for granted.

Table 2 shows some key statements that make up these dimensions.

Table 2

Statements Behind the Four Underlying Dimensions

Perceptions of company concern and caring for customers

- Provides information and options to help customers use electricity more efficiently and economically.
- Explains to customers the reasons why they are being charged at the current rates.
- Keeps public informed about the company and its policies.
- Takes an interest in the views of its customers.
- Works together with customers in developing programs that benefit both.
- Shows concern for customers and their problems.

Perceptions of reliability of service

- Provides reliable service.
- Restores power quickly in an emergency.
- Has helpful, understanding, and courteous employees.
- Works hard to satisfy customer needs.

Perceptions of management competence

- Effectively manages a large complex system.
- Has efficient and cost-conscious management.

Perceptions of company as monopoly

- Is a monopoly that doesn't have to care about its customers.
- Is a monopoly that can charge whatever it wants for electricity.
- Is a monopoly that doesn't have to be managed efficiently because it can pass on costs to customers.
- Takes customers for granted.
- Makes too much profit.

Again, on each of the four dimensions underlying opinions about their electric company, customers were segmented into groups that gave responses in the low, moderate, and high ranges. On the first dimension of perception of company concern and caring, 17 percent of the customers rank their own company low in its demonstration of concern and caring for them, 52 percent give their company a moderate score in this area, and 31 percent rate their company high. Demographic breakdowns show that retired people and homemakers rate their utility higher than do customers in other employment categories. Perception of high company concern and caring declines substantially with the size of the customer's average monthly electric bill but is higher among customers with less education and income. Respondents 56 years of age and over are more likely, while customers aged 26 to 35 are less likely, to rate company concern and caring as high.

On the reliability of service dimension, however, we see that 4 percent rate reliability low, 37 percent say it is moderate, and 59 percent say it is high. Except for customers who have average monthly electric bills of $126 or more or who are between the ages of 18 and 25, all other demographic segments rate reliability as high. And even among these two groups, most rate reliability as moderate. Satisfaction with reliability is slightly higher among women than men and among retired people and homemakers than among other occupational segments. Not surprisingly, high assessments of reliability tend to decline as the size of customers' monthly bills goes up. There is also a marginal but noticeable tendency for high assessments in this area to decline with greater education and income. Favorable ratings show a strong tendency to increase with age.

On the third dimension—perceptions of management competence—13 percent give their company a poor rating, 45 percent give a moderate rating, and 42 percent give a high rating. Retired persons and homemakers are more likely than people in other employment situations to rate company management highly. Interestingly, high ratings increase as income declines, while, predictably, the lower the average monthly bill, the higher the proportion of customers that gives high marks. Finally, high ratings of management are substantially higher among older customers (56 years or age and over) than among younger ones.

Finally, on the last dimension of

how customers perceive their electric company, we find that 20 percent think the concept of "monopoly" does not describe their utility, 45 percent feel the concept describes their utility moderately well, and 35 percent feel it describes their company very well. Customers with higher electric bills are substantially more likely than those with lower bills to see the utility as a monopoly. College graduates and those earning $35,000 or more annually are less likely than customers with lower levels of education and income to say that "monopoly" applies.

The overall percentages that fall into the three segments on each of these four dimensions show clearly that today's customers give high ratings to service reliability. At the same time, customers overwhelmingly believe their electric company is a monopoly—a monopoly that takes them for granted and demonstrates only a moderate degree of concern and caring for them as individuals with unique needs.

What Explains the Attitudes

Finding out how different customer segments think about electricity and the utility that provides it was one important objective of the Residential Customer Market Segmentation Study. Another objective was determining the extent to which each of the dimensions discussed above actually accounts for basic customer attitudes. To what degree do the dimensions underlying customers' evaluations of electricity and their electric companies affect their favorability toward the companies, their feelings about the fairness of the electric rates they pay, and their sense of personal control over the dollar amount of their electric bills?

To answer these questions, we used several multivariate techniques—correlation, regression, and conjoint analyses—to analyze the data we collected. One overriding conclusion emerged: Judgments and evaluations customers make of the provider—the electric utility—are at least as important as the judgments and evaluations they make of the product—electricity—in explaining overall favorability, attitudes toward rates, and feelings of control over costs.

Table 3 shows the four attitude dimensions that most account for how residential customers evaluate their electric companies, their electric rates, and their sense of control over electricity's costs. In each instance, the most important attitude dimensions are those that describe evaluations of the provider, not the product. Significantly, in all three instances, the concern and caring dimension gets top ranking.

Table 3

Rank Orderings of Four Basic Dimensions that Most Explain Favorability Toward Company, Fairness of Rates, and Feelings of Control Over Costs.

Favorability toward company
Company concern and caring
Reliability of service
Costs/control over costs
Management competence
Fairness of rates
Company concern and caring
Reliability of service
Control over costs
Value of electricity
Feelings of control over costs
Company concern and caring
Reliability of service
Management competence
Value of electricity

The Road to Satisfaction

To summarize then, the Residential Customer Market Segmentation Study carries three messages:

- Customers think about their electric company both along a product dimension and along a service or concern and caring dimension.
- Customers' ultimate evaluations of issues like company favorability, the fairness of rates, and their ability to control their bills are equally explained by the perceptions they have of their utility in both the product and service or concern and caring dimensions.
- Customers' positive perceptions in the service or concern and caring dimension can actually offset negative perceptions in the product dimension.

Thus, if an electric company

RESIDENTIAL CUSTOMER MARKET SEGMENTATION STUDY: WHAT SOME PEOPLE SAID

"I think the electric utility industry should be more diversified, actually. I think they should do the same thing as they did with AT&T. Create more competition in the market of energy."

"If you look at the rate structure, it's totally backwards. You use next to nothing and you're paying $30 a month, and then the rates start dropping as you use more electricity . . ."

"You have control over what you use . . . I try to conserve energy myself, but my bill seems to go up more than down, even though I use less."

"They do a lot of things for you that appear to be nice, but they aren't aggressively service-oriented. If you deal with an airline, they are very aggressive to provide you with good service . . ."

"If they could publish the fact that they have these services available and for free . . . it might make the general public feel a little better about them. But they don't . . ."

"I really feel as though I'm not in control of my electricity because I'm not there making decisions . . . I'm not in control of it at all."

"There's more than one department store. If you don't like the service in one store, you can go to another. But with the electric company, where can you go? That's the whole thing in a nutshell, I think."

"I think they should do more caring for us, the consumers, because we are the ones who pay the bills that they send every month."

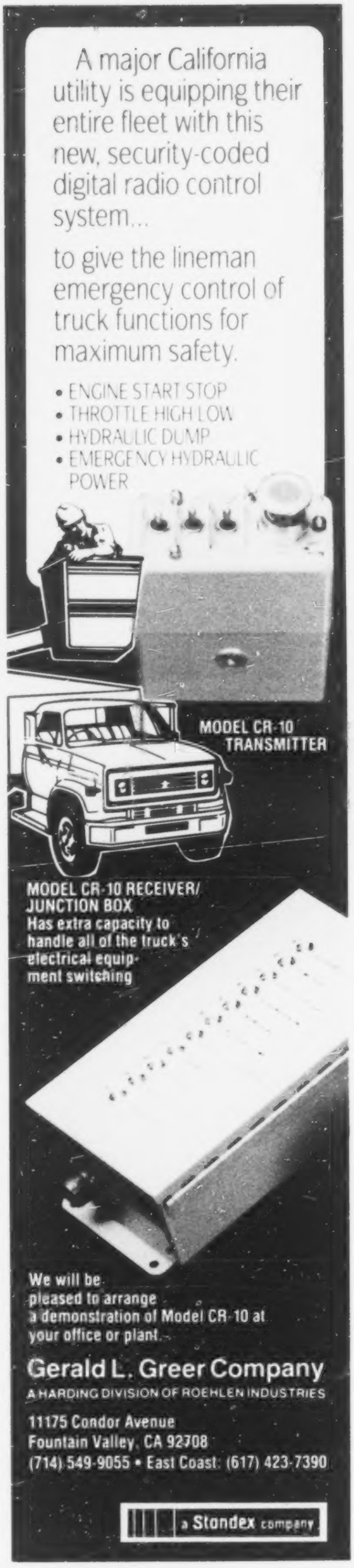
"Sometimes I feel a little helpless when it comes to electricity. Because if the price goes up, there's not much I can do except pay for it."

truly wants optimal customer attitudes and success in its marketing, consumer affairs, communications, and other corporate efforts, it must build, from the very top to the very bottom, a corporate culture that is customer-driven. To survive in a rapidly changing environment, an electric company must be both a superior product and superior service delivery organization. To attend to only one of these areas will not work.

Achieving customer satisfaction demands that the electric utility industry accept the fact that in the eyes of its residential customers the business has a dual nature. The industry must then act accordingly. Only by delivering total customer satisfaction in both the product and service areas can solid loyalties be built. Once earned, these loyalties will be the industry's greatest asset as it weathers changing times and plunges into a new era of deregulation and competition.

Stay Tuned for More

Because it is critical that electric companies prove themselves to be concerned and caring institutions, the logical next step was to find out through further analysis of customer opinions and attitudes what types of programs and activities can best do this and which customer segments respond best to which programs. The results of this follow-up research, called the Residential Customer Program Segmentation Study, will be presented in the next issue of this magazine. ■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Carl D. Hobelman

Federal-State Rate Battles: Is the War Almost Over?

Calling a cease-fire is now up to the Supreme Court.

The hills of western North Carolina and eastern Tennessee are the hottest and perhaps the last battleground in the escalating fight between states and the federal government over who pays the costs and who reaps the benefits of electricity. The United States Supreme Court may soon silence the guns by ruling on a long-standing dispute between Nantahala Power and Light Company, a subsidiary of the Aluminum Company of America (Alcoa), and consumer interests in North Carolina over the use of cheap hydroelectric power produced by Nantahala and another Alcoa subsidiary in North Carolina and Tennessee.[1]

Firing the First Shot

Federal-state battles over regulating electric rates and allocating generating resources have been both bitter and frequent over the past 60 years. The New England states gave birth to litigation over such disagreements in the 1920s. The first important United States Supreme Court decision on the issue, *Public Utilities Comm'n. v. Attleboro Steam and Electric Co.*,[2] found a "gap" between the existing state regulatory scheme and the exclusive power of Congress to regulate matters of significant national interest under the Constitution's Commerce Clause. The Court's decision led to the enactment of Part II of the Federal Power Act in 1935. The Act gives exclusive jurisdiction to regulate sales for resale in interstate commerce and the transmission of electricity in interstate commerce to the Federal Energy Regulatory Commission (FERC).

Over the next 30 years, the Supreme Court defined the scope of federal regulation of wholesale transactions and the "traditional" state regulation of retail rates to ultimate consumers. Gradually, a "filed rate" doctrine emerged in both electric and gas cases, the latter under the Natural Gas Act of 1938, which is also administered by the FERC. The United States Supreme Court held that the "right to a reasonable rate is the right to the rate which the Commission files or fixes, and that, except for review of the Commission's orders, the Courts can assume no right to a different one on the ground that in its opinion it is the only or the more reasonable one."[3]

And, following that Court's lead, the Mississippi Supreme Court held that a "pipeline must charge and United must pay the filed rates . . . there is nothing to suggest that the FPC [predecessor of the FERC] will not closely scrutinize this relationship, for the statutory purpose of protecting the public and consumers from exploitation."[4]

In 1964, in a decision involving the City of Colton, California, and Southern California Edison Company, the Supreme Court wrote that Congress meant to draw a "bright line easily ascertained, between state and federal jurisdiction."[5]

The issue appeared to be laid to rest.

States Keep the Pressure On

Not so.

State regulators continued to assert control over the impact of all power production and transmission costs upon local ratepayers, even when the transactions involved interstate commerce. The rift deepened when the orders of state commissions began to contradict the orders of the FERC. Arguments arose from the rapidly increasing costs of nuclear and other forms of generation, from the costs of abandoning plants, and from the need to share costs of extra-high-voltage transmission facilities serving a multi-state region.

The battlelines were again drawn in Rhode Island, where the *Attleboro* case was fought half a century earlier. The Rhode Island challenge, involving The Narragansett Electric Company, was summarized by the North Dakota Supreme Court in a later proceeding:

> Narragansett Electric Company was a retail electric utility company serving customers in Rhode Island. Its retail rates were regulated by the Rhode Island Public Utilities Commission. Narragansett purchased electrical power from New England Power Company [NEPCO], a Massachusetts corporation. Narragansett and NEPCO were wholly-owned subsidiaries of New England Electric System [NEES]. Because NEPCO was an interstate wholesale supplier of electricity, its rates were subject to regulation by FPC (predecessor of FERC). NEPCO filed a rate increase request with FPC. Part of NEPCO's rate increase resulted from losses incurred when it abandoned construc-

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Carl D. Hobelman is a senior partner in the Washington, D.C., law firm of LeBoeuf, Lamb, Leiby & MacRae.

There's little peace in the valleys around the Great Smoky Mountains where Nantahala Power and Light does business.

tion of a generating station. Narragansett subsequently filed a request with the Rhode Island Public Utilities Commission to increase their rates, subject to a possible refund, to cover the increased cost of obtaining power which resulted from the rate increase filed by NEPCO with FPC. The Rhode Island Public Utilities Commission ruled that it could investigate the reasonableness of the costs underlying NEPCO's rate increase filed with the FPC and could prevent Narragansett from passing through to its retail customers any portion of those costs which were "strikingly" or "glaringly" unreasonable.

Narrangansett appealed and contended that the Rhode Island Public Utilities Commission lacked jurisdiction to inquire into the reasonableness of NEPCO's wholesale rate to Narragansett because the Federal Power Act preempted the authority of state commissions to investigate interstate prices. The Rhode Island Supreme Court agreed and held that for purposes of fixing intrastate retail rates the Rhode Island Public Utilities Commission was required to treat NEPCO's interstate wholesale rate filed with the FPC as an actual and reasonable operating expense.[6]

The Rhode Island Supreme Court wrote what has come to be known as the "Narragansett doctrine" as follows: "No matter what method [a Commission] adopts in considering [a utility's] proposed rate increase, it must treat the [FERC] filed . . . purchase price . . . as an actual operating expense."[7]

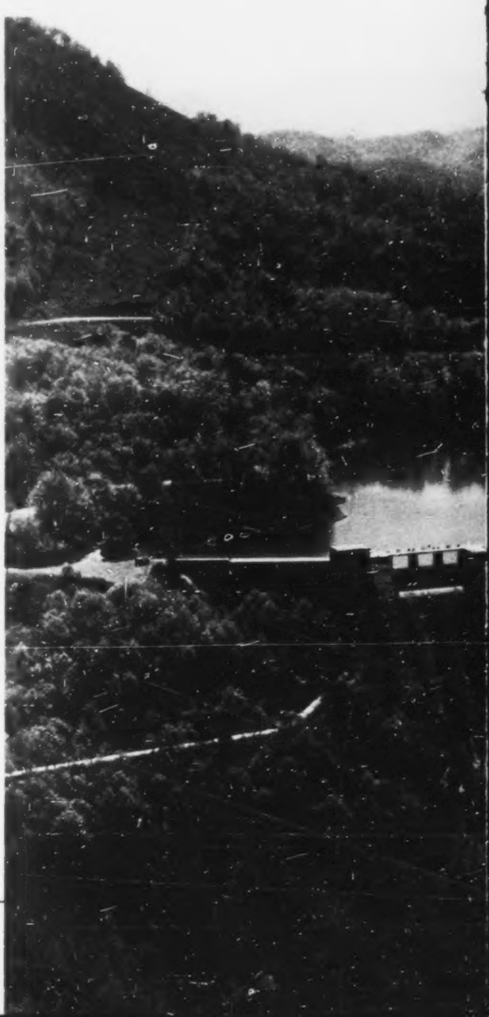
Costs ignite Commissions

Still, state commissions elsewhere in the United States were not intimidated for very long by law made in Rhode Island. Conflicts quickly arose in North Dakota, Minnesota, and Massachusetts over the abandonment of nuclear power plants, where the highest state courts followed the Narragansett doctrine;[8] in North Carolina, as a result of a dispute over the allocation of hydro resources (the *Nantahala* case); in Pennsylvania, as a result of differing costs of purchased power to a subsidiary of Orange and Rockland Utilities; in New Hampshire, over the costs of abandoned nuclear plants; in Kentucky, over the cost of a new coal-fired generating plant; in West Virginia, over the allocation of costs of extra-high-voltage transmission facilities built by the American Electric Power system for the benefit of all its operating companies; and in the Gulf States area, where litigation continues concerning the allocation of the cost of the Grand Gulf nuclear plant in Mississippi.

Current attacks are somewhat more sophisticated than the original approach taken before the Rhode Island Public Utilities Commission to the effect that "glaringly unreasonable" rates should not be passed through to retail customers. Attacks based on the prudence of utility management in choosing among alternative sources of power have chipped away at the Narragansett doctrine, but, for the most part, the Rhode Island Supreme Court's opinion that costs resulting from FERC-approved rates must be recognized as operating expenses and its concomitant that such expenses must be passed through to retail ratepayers has successfully withstood the assault.

The federal preemption doctrine is based upon Article VI of the United States Constitution, which declares federal law to be the supreme law of the land: "This Constitution, and the Laws of the United States which shall be made in Pursuance thereof; and all Treaties made, or which shall be made, under the Authority of the United States, shall be the supreme Law of the Land; and the Judges in every State shall be bound thereby, anything in the Constitution or Laws of any State to the Contrary notwithstanding."

The decisions by the highest courts in Minnesota, North Dakota, and Massachusetts, mentioned earlier, upheld the supremacy of federal law as represented by the FERC's cost allocation and ratemaking orders. The FERC's deter-



Tapoco, itself owned by Alcoa, owns the Santeetlah dam in western North Carolina and operates it with TVA to generate power for Alcoa's aluminum plant in eastern Tennessee. Customers of Nantahala Power and Light, another subsidiary of Alcoa, want the cheap electricity from Santeetlah and three other dams to serve their homes in western North Carolina.

minations of costs, rates, and cost allocation among wholesale suppliers were ultimately reflected in consumer rates at the retail level in those states, sometimes with and sometimes without the blessing of the state regulatory commission.

But FERC-approved costs have not been supinely accepted by all state governments, regulatory commissions, and courts. Utilities have been frequently forced to rely upon the federal judiciary system to seek recovery of such costs in retail rates.

FERC Cuts Down the Grand Gulf Deal

In June 1985, the FERC issued an order approving wholesale rates for power from Unit One of the Grand Gulf nuclear power plant in Mississippi. The FERC allocated the cost of the unit among all four operating utilities of Middle South Utilities, finding that the Middle South companies "constitute a highly coordinated integrated electric system."[9] The FERC rejected the contract arrangements agreed upon by the Middle South group in their original filings, which had allocated none of Grand Gulf's generating capacity to Arkansas Power & Light Company and which had reallocated the cost of the unit so as to require Arkansas Power & Light to bear 36 percent of its cost,[10] two Louisiana companies to bear an aggregate of 31 percent, and Mississippi Power & Light Company to bear 33 percent. Litigation was also begun in Louisiana, Mississippi, and Missouri to implement the FERC order by having Grand Gulf costs recognized in retail rates.[11] Such recognition has now been achieved in Arkansas (by settlement), in Mississippi (by Public Service Commission order), in Missouri (by Federal District Court order), and in Louisiana (by settlement).

In an action springing from the Grand Gulf controversy in Arkansas, the United States Court of Appeals for the Eighth Circuit upheld a District Court restraining order prohibiting the Arkansas Public Service Commission from investigating the contracts involved in the Grand Gulf transaction. The Court of Appeals concluded that "the APSC's desire to protect Arkansas' interests has resulted in an impermissible burden on interstate commerce."[12]

Feds Jump In in West Virginia

In February 1985, a Federal District Court in West Virginia issued a preliminary injunction against the West Virginia Public Service Commission requiring it to refrain from action contrary to a FERC decision approving an agreement allocating to Appalachian Power Company, a member of the American Electric Power system, a share of the cost of extra-high-voltage transmission lines throughout the AEP system and supporting the reliability of the entire system. In February 1986, the District Court permanently barred the state commission from interfering with the federally-approved rate, finding that "[t]he PSC does not have the power to deny to Appalachian recovery of its costs incurred under a FERC approved Transmission Agreement. . . . Control of cost re-

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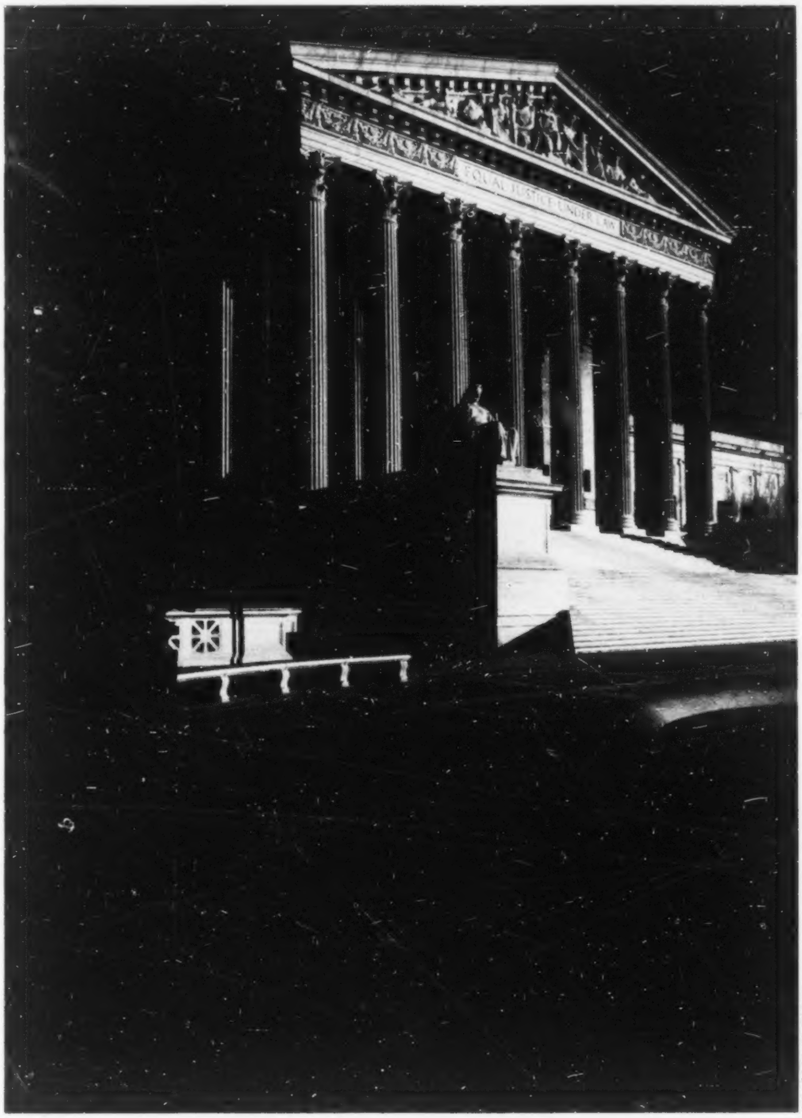
covery provides a superior power over the agreement and would stand as a clear obstacle to the accomplishment and execution of the purposes and objectives of the Federal Power Act."[13]

However, federal courts are not always willing to intervene in this fashion because of the strictures of the Johnson Act[14] and because the courts generally desire to maintain federal-state comity, especially where pending state judicial proceedings involve "important state interests." State officials' reluctance to force retail consumers to pay hundreds of millions of dollars in wholesale power costs is quite understandable in light of economic and political realities. Industries and jobs are more and more fungible in our economy. States and localities have critical long-term interests at stake in reducing the costs of industrial production and in maintaining a viable tax base. Moreover, utility rates have been such easy political targets that very few officials are willing to promote the long-term public gain—especially when that "public" is a region of several states—if short-term local public interests would be injured.

This, then, is the legal and economic context in which the *Nantahala* dispute has reached the United States Supreme Court today.

Nantahala's $40 Million Slap

Nantahala Power and Light Company is an electric utility owning and operating hydro plants in western North Carolina. It serves customers at wholesale under rates regulated by the FERC and at retail under rates set by the North Carolina Utilities Commission. Tapoco, Inc., is a Tennessee corporation



John Aikins: Uniphoto

whose sole function is to manage the power supply to an aluminum smelting and fabricating facility owned by Alcoa near Knoxville. Tapoco owns hydro plants in both states. Nantahala and Tapoco are both wholly-owned subsidiaries of Alcoa.

Under the facts at issue, Nantahala generated low cost power at its own hydro facilities in North Carolina and exchanged the power with the Tennessee Valley Authority (TVA) for TVA power entitlements. Similarly, Tapoco's low cost hydro generation was exchanged for TVA entitlements by Alcoa. Both Alcoa and Nantahala purchased more expensive supplemental TVA power when their entitlements were insufficient to meet load demands.

The arrangements of both companies with TVA were included in an agreement called the New Fontana Agreement, which was filed with and regulated by the FERC. The entitlements of each company to TVA power given in exchange for the output of Tapoco's and Nantahala's plants were divided between Nantahala and Tapoco through an apportionment agreement, which was also regulated by the FERC as part of the New Fontana Agreement. The FERC held lengthy hearings and, after requiring some change in the treatment of energy entitlements under the apportionment agreement, found both agreements to be reasonable.[15]

In retail rate proceedings in North Carolina, the North Carolina Utilities Commission found that Nantahala should have received more low cost TVA entitlements and, thus, should not have had to purchase as much supplemental TVA power to meet its load in excess of its entitlements. The North Carolina Commission, through an allocation procedure different from the FERC-regulated allocation procedure, disallowed 74 percent of the costs Nantahala had paid for supplemental power from TVA. The aggregate impact on Nantahala of two retail rate proceedings was a refund requirement of over $40 million. The North Carolina Commission's rulings were upheld by the intermediate appellate court in North Carolina and by the North Carolina Supreme Court.[16]

High Court Takes Over

The decision of the North Carolina Supreme Court in the first retail rate proceeding is the one that the United States Supreme Court has agreed to review. The appellants[17] argue that the orders of the North Carolina commission are preempted through the Supremacy Clause by FERC regulation (citing the "filed rate" and Narragansett doctrines) and place an undue burden upon interstate commerce in violation of the Commerce Clause (citing, among other cases, the Eighth Circuit's decision in *Middle South Energy, Inc.* and a 1982 decision of the United States Supreme Court that invalidated a New Hampshire law requiring that rates be set so as to effectively preserve the benefits of New Hampshire's hydroelectric resources for the residents of New Hampshire alone).[18]

In *Nantahala* and in most of the other cases described above, the FERC proceeding focused on identifying and allocating the costs of power among several companies. But, in some other proceedings, the FERC expressly refused to consider the issue of whether or not the buyer in a bilateral power transaction acted prudently in choosing to complete the purchase in question rather than to seek to satisfy its power requirements from an alternative, presumptively less expensive, source.[19] These atypical efforts by the FERC to limit its own jurisdiction seem unduly restrictive and unwarranted by the Federal Power Act's mandate to the Commission to determine "just and reasonable" rates. The FERC's refusal to consider a buyer's "prudence of choice" in the bilateral contract situation has proven to be unwise as well as unwarranted, from the buyer's standpoint, because commissions in several states have taken the FERC's refusal to consider the issue as an invitation to second guess the buyer's choice among alternate power sources.

In Pennsylvania, an intermedi-

John M. Hall

Nantahala's and Tapoco's service territories, the beautiful Great Smoky Mountain region, attract an increasing number of tourists and summer residents.

ate Appellate Court upheld a state commission order setting rates for Pike County Light and Power Company based on reduced purchased power costs that might have resulted from a purchase available from its neighbor, Pennsylvania Power & Light Company, rather than rates based on the higher cost actually incurred by a purchase from its parent company, Orange and Rockland Utilities. The purchase from Orange and Rockland was made pursuant to a FERC-approved rate schedule.[20] The commission was aware that PP&L was willing to serve Pike County and that Pike County had the right to terminate its contract with Orange and Rockland upon six months' notice.

In New Hampshire, the Supreme Court rejected the state Public Utilities Commission's reliance on the Narragansett doctrine in setting rates for Connecticut Valley Electric Company. The state Supreme Court found that the utility had not met its burden of proof to show that the purchase at the FERC-approved rate was "the product of reasonable efforts to secure the lowest cost in light of appropriate alternatives available to the company." In support of its analysis and conclusions, the New Hampshire Supreme Court referred to the *Pike County* case and to cases in which the FERC had refused to consider the purchaser's prudence of choice among alternatives.[21]

The War Must End

Nantahala offers the United States Supreme Court an historic opportunity to refresh the "bright line" between federal and state rate jurisdictions. The court may take the opportunity presented by the *Nantahala* appeal to affirm broad FERC jurisdiction over wholesale sales and to shut down end-runs around the Narragansett doctrine by ruling that the Supremacy Clause and the Federal Power Act prohibit state regulators from looking behind a rate filed with the FERC on any pretext. If the Court does not seize the opportunity to settle the broad issues, including the question of a buyer's prudence of choice, interstate struggles over the cost of power resources and the prudence of utility management action will continue to flare up before federal and state regulatory agencies, in legislatures, in the media, and in the courts.

Notes

1. *Nantahala Power and Light Co. v. North Carolina, ex rel Utilities Comm'n.* No. 85-568 (12/9/85).

2. 273 U.S. 83 (1927).

3. *Montana-Dakota Utilities Co. v. Northwestern Public Service Co.*, 341 U.S., 246 at 251-52 (1951).

4. *United Gas Corp. v. Mississippi Public Service Comm'n.*, 240 Miss. 405, 422, 127 So.2d 404, 420 (1961).

5. *Federal Power Comm'n v. Southern California Edison Co.*, 376 U.S. 205, 215-16 (1964).

6. *Northern States Power Co. v. Hagen*, 314 N.W. 2d 32 (N.D. 1981).

7. *Narragansett Electric Lighting Co. v. Burke*, 119 R.I. 559, 381 A.2d 1358, 1363; *cert. denied*, 435 U.S. 972 (1978).

8. *Northern States Power Co. v. Hagen*, 314 N.W. 2d 32 (N.D. 1981); *Northern States Power Co. v. Minnesota Public Service Comm'n.*; 344 N.W. 2d 374 (Minn. 1984), *cert. denied*, 467 U.S. 1256, 104 S.Ct. 3546-47 (1984); *Eastern Edison Co. v. Department of Public Utilities*, 388 Mass. 292, 446 N.E.2d 684 (1983).

9. *Middle South Energy, Inc. and Middle South Services, Inc.*, Opinions Nos. 234 and 234-A, 31 FERC ¶ 61,305, *reh'g. denied*, 32 FERC ¶ 61,425 (1985).

10. The scope of, and limitations upon, the FERC's authority to compel an unwilling but affiliated utility to accept high cost nuclear capacity is at issue on review of the FERC's orders in the Grand Gulf proceedings by the United States Court of Appeals for the District of Columbia Circuit.

11. *Louisiana Power & Light Co. v. Louisiana Public Service Comm'n.*, No. 292,026 (La., 19th J.D.C. 1985); *New Orleans Public Service, Inc. v. City of New Orleans*, No. 85-3398 (E.D. La. 1985), *rev'd.*, *New Orleans Public Service, Inc. v. City of New Orleans*, No. 85-3654 (5th Cir. Feb. 14, 1986); *Arkansas Power & Light Co. v. Missouri Public Service Comm'n.*, No. 86-4067 (W.D. Mo. 1986); *Mississippi Power & Light Co.*, MPSC Dkt. No. U-4620 Final Order on Reh'g. (Sept. 16, 1985).

12. *Middle South Energy, Inc. v. Arkansas Public Service Comm'n.*, 772 F.2d 404 (8th Cir. 1985).

13. *Appalachian Power Co. v. Public Service Comm'n of West Virginia*, 614 F. Supp. 64 (S.D.W.Va. 1985), *aff'd.* Nos. 85-1351, 1352 (4th Cir. July 25, 1985) (unpublished); Order granting summary judgment, No. 2:85-0098 (Feb. 14, 1986).

14. The Johnson Act, 28 U.S.C. §§ 1331, 1342, prohibits Federal District Courts from interfering with compliance with state retail rate orders if four specific criteria are met. At least one of these criteria: that the order "does not interfere with interstate commerce" is arguably *not* met in cases involving the kind of conflicts presented by the cases being discussed in this article. Nevertheless, the Act remains a formidable barrier to federal court intervention to enforce collection of wholesale purchased power costs in retail rates.

15. *Nantahala Power and Light Co.*, 19 FERC ¶ 61,152 (1982), *reh'g. denied* 20 FERC ¶ 61,430 (1982).

16. *North Carolina, ex rel Utilities Comm'n. v. Nantahala Power and Light Co.*, (Sub 29) 313 N.C. 614, 332 S.E.2d 397 (1985); and (Sub 35) 314 N.C. 246, 333 S.E. 2d 217 (1985).

17. Nantahala Power and Light Co., Tapoco, Inc., and Alcoa are the Appellants. The State of Tennessee and Edison Electric Institute filed briefs *amicus curiae* supporting the Appellants' request to be heard by the Supreme Court.

18. *New England Power Co. v. New Hampshire*, 455 U.S. 331 (1982).

19. *Philadelphia Electric Co.*, 15 FERC ¶ 51,264 (1981); *Pennsylvania Power & Light Co.*, 23 FERC ¶ 61,005 (1983). *Pacific Power & Light Co.*, 27 FERC ¶ 61,080 (1984); compare, *AEP Generating Co.*, 29 FERC ¶ 61,246 (1984), *interim order*, 32 FERC ¶ 61,364 (1985) and *AEP Service Corp.*, 32 FERC ¶ 61,363 at 61,818 (1985), where the FERC, when dealing with pool transactions, has indicated that it may limit its self-imposed jurisdictional restriction to bilateral transactions.

20. *Pike County Light and Power Co. v. Pennsylvania Public Utility Comm'n.*, 77 Pa. Commw. Ct. 268, 465 A.2d 735 (1983).

21. *Appeal of Sinclair Machine Products, Inc.*, No. 84-380 (N.H. 1985).

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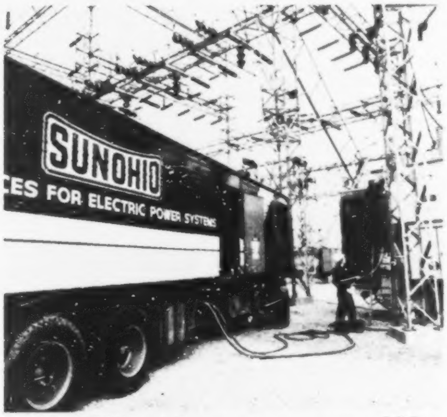

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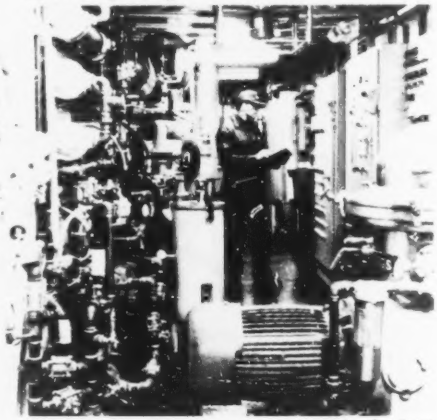

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Fitness and the Bottom Line

Staying healthy is the most profitable thing a company can help its employees do.

Remember Bob Richards? Thirty years ago, a few individuals like this Olympic pole-vaulter campaigned throughout the country against "chicken fat." Off your duffs, Richards exhorted. The average American worker was no longer toiling in the fields, so it was high time to stretch muscle. One hundred years ago, human strength churned out 33 percent of farm and industrial power; today, machines provide more than 99 percent.[1]

And people should eat properly as well, warned Richards. You'll recall that he favored Wheaties, a cereal whose manufacturer happened to be paying him to promote this advice. By the early 1960s, the nation had learned from crusaders such as Richards that smoking, cholesterol, and stress were bad on the body.

Since then, the Bob Richardses have proliferated, into the Richard Simmonses and Jane Fondas. Now Americans are jazzercising and jogging, cycling and swimming, and just generally getting rid of that chicken fat. Each of the several thousand runners who met the qualifying time to compete in this year's Boston Marathon would have beaten the best Olympian of the turn-of-the-century. Yogurt has been elevated from the food of hippies to the repast of yuppies.

Fitness has been popularized. And now it's being corporatized. "Two of the most serious occupational health hazards are the desk and swivel chair," notes Dr. Richard O. Keelor, who has served as director of program development for the President's Council on Physical Fitness and Sports. "They deprive working men and women of opportunities for needed exercise. The typical job in a modern office or automated factory requires less physical exertion than a hot shower."[2]

The Price of Health

Corporate America's interest in health promotion has been piqued by the bottom line. Improvement of the average physique notwithstanding, health care costs are skyrocketing. The culprits are many—the expense of modern medical technology, together with the inappropriate and unnecessary use of medical services, the development of new cures, and the increasing use of company health benefits as an employment perquisite (discouraging careful shopping for health care). The elongation of life and the general inflationary rise of prices have also contributed to the cancer of growing costs. Between 1973 and 1983, health expenditures leaped from 7.8 percent to nearly 11 percent of the gross national product. Twenty years ago, health care services cost $27 billion; today, the bill is nearly $230 billion.[3]

Alarming statistics proliferate. The health benefits promised to future retirees are estimated at up to $2 trillion, more than the combined total assets of the 500 largest U.S. corporations.[4] Commonwealth Edison projected in 1982 that its medical care expenditures and benefits for employees would reach $500 million by the year 2000.[5]

Loss of labor production due to premature death in the United States has been estimated to be worth $19.4 billion a year; loss because of illness is an estimated $3 billion; grief and disruption of homelife may be $5 billion. Heart attacks alone cost industry 132,000,000 work days each year, about 4 percent of the output by those who are stricken.[6]

But by the late 1970s, corporate America decided it wasn't going to accept rising health care costs, well, lying down. Industry launched a concerted attack on health care costs. By 1984, there were 135 business coalitions with approximately 6,500 organization members nationwide attempting to promote health costs management through educational programs and legislative action.[7]

Success stories abound.

In Houston, at Prudential Insurance Company's southwest home office, major expenses for medical and disability benefits were assessed before and after the establishment of a fitness and health promotion program. The result: major yearly medical costs dropped from $574 to $312 for each participant in the study. When direct disability costs were added, the company figured its average annual savings per participant was $353, compared with a fitness program cost of $121 a year.

Johnson and Johnson's "Live for Life" health program boasted a 26 percent reduction in the number of employees with hypertension after

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Bartlett Naylor is a Washington, D.C.-based reporter specializing in finance.

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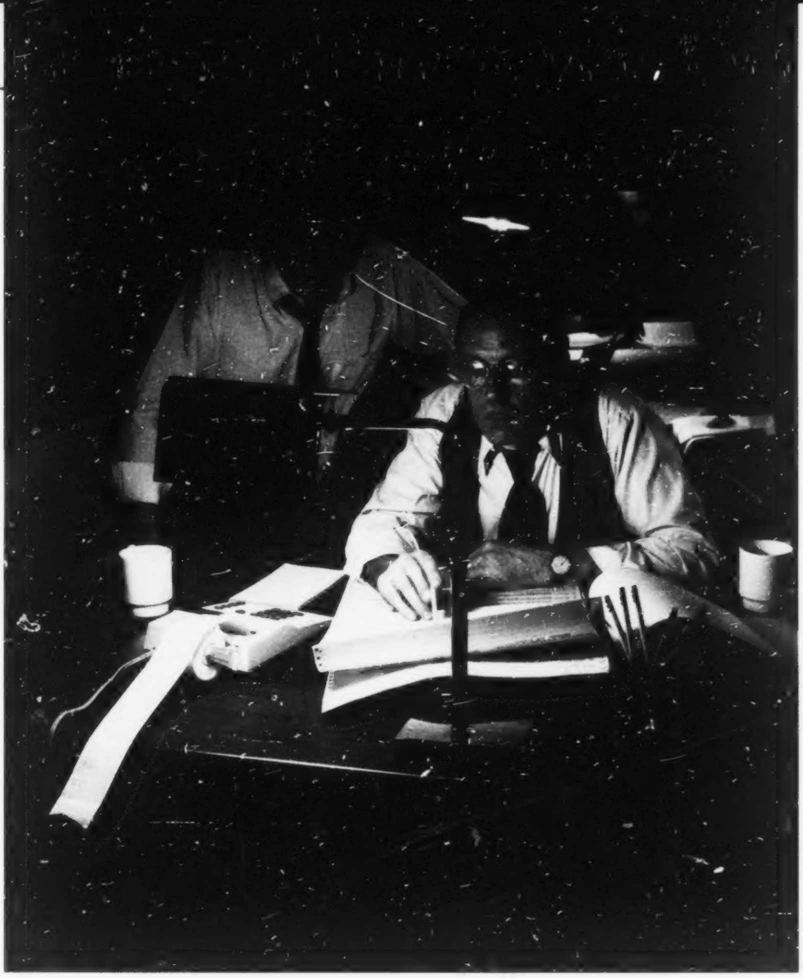
It's time to stretch the company health care dollar.



The stress and confinement of the typical office environment take a heavy toll on employees' health.

Carroll Seghers II / Uniphoto

a year and that one-fourth of the participants quit smoking. Smoking is a major expense. Experts predict companies can save up to $1,000 per employee a year if they can convince him or her to quit.

Houston's Tenneco, Inc., found that over the three years it operated a fitness program, participants not only reduced their sick-hours, but were peppier performers on the job. The company found that a high proportion of excellent workers were active exercisers, while a great number of poorer workers were non-exercisers.

The Bottom Line

In the face of such testimonials, why haven't all utilities seen the light?

A major problem is that the purveyors of many of these success stories are not unbiased. The five examples above, for instance, were taken from an advertising supplement in *Business Week* paid for by the Association for Fitness in Business.[8]

Utility finance officers, confronted as always with tight budgets and scrutinizing regulators, wonder if these success stories and alarming statistics are little more sophisticated than grocery store advertisements where shoppers are told they can "save" by spending. After all, selling a company gymnasium as a cost-containment measure might arouse a few suspicions.

"An ever-present danger is that when any movement reaches panacea proportions, objectivity will be lost," comments Dr. Henry R. Herbert of the Uniformed Services University of the Health Sciences, Bethesda, Maryland.[9]

As utilities study the fitness/health cost balance, they confront conflicting findings.

That adult life expectancy is determined by genetics, health care, environment, and personal lifestyle is a viewpoint supported by Commonwealth Edison. Though the nature/nurture controversy has yet to be settled, research suggests that an individual's own behavior—eating, exercising, smoking, drinking, relaxing—accounts for 53 percent of his or her chances of leading a long life, or cutting it short.[10]

Yet another company struggling with these same numbers may be persuaded by the glass-is-half-empty side of this finding—that 47 percent of health is out of personal control.

The Health of Utilities

If fitness promotion at work is the wave of the future, utilities as a whole have not led the way.

"Utilities are in a very competitive industry," says Bruce Trout, general manager for human resources at Portland General Electric Company. "Costs related to employee health are another expense we have to deal with. When companies say their employees are a valuable resource, they must recognize the costs associated with keeping them healthy and on the job."

What is the state of health promotion among American utilities?

Southern California Edison Company can count itself as one utility ahead of its time in managing health care costs and was highlighted by a University of California study that examined "advanced" programs among U.S. firms in general.[11]

The 21,000-employee utility has employed physicians and operated its own health care delivery system since 1902 and now provides direct medical care at ten locations

Universal Gym Equipment, Inc

Stacy Pick/Uniphoto

Above, left:
Some utilities offer gym facilities, others arrange discounts at local clubs.

Above, right:
Health risk appraisals tell workers where their potential problems may be.

throughout its service territory. At its headquarters in Rosemead, California, there is a pharmacy staffed by six pharmacists who fill nearly 500 prescriptions daily, a service available both to employees and retirees in and out of state. The company has also contracted with more than 800 physicians and three hospitals. Participants receive 100 percent coverage after payment of an annual deductible fee. Recently, the company re-focused its mission from "taking care" of its employees' health to educating employees to "take care of yourself," as the company literature says.

In concert with this shift, smoking cessation and cancer detection programs were instituted. Smokers pay $365 for several seminars. If they remain non-smokers for six months, they get half the fee back; if they make it a year, they get the other half. In 1985, Southern California Edison added a weight control program with a similar reimbursement plan. Participants pay $210 for a 12-week course wherein they contract to lose a reasonable amount of weight. If they lose the pounds agreed upon within the first six months, they get half the fee back; if they maintain the weight loss for another six months, they get the other half.

Results: Southern California Edison spends about $1,000 for each participant in health care, compared to the $1,365 average for other Los Angeles employers. Particularly successful is the cancer detection program. A total of 2,738 employees attended a cancer education program in 1984 and 1985, and 2,147 underwent screening. Of those screened, 485 were referred to physicians.

"But the actual savings is difficult to measure without following each case and invading medical privacy," cautions Susan Keesee, administrator for Southern California Edison's HealthWorks system. Citing such studies as those of Duke University's Dr. David Eddy who found that it can cost a company $60,000 for each employee found to be suffering an advanced stage of cancer, Keesee has enjoyed unwavering support for the cancer program, she says.

Portland General Electric Company has an "aggressive" health care cost containment program according to Bruce Trout of the Oregon utility. There are essentially three parts: a health risk appraisal program, a fitness facility, and a menu of optional health insurance plans.

Experts are hired to examine employees (on a voluntary basis) and to recommend changes in diet and lifestyle. Trout reports that about half of the workforce has taken advantage of this service.

Portland General's fitness center is called the "Fit Factory." It includes a compliment of weight machines, as well as mats and space for aerobics classes. The corporation contributes some money, but the gym is largely sustained by em-

Some electric companies organize aerobics classes, softball teams, or bowling leagues, more for fun and relaxation than as part of a formal health promotion program.

ployee-paid dues. Based on the success of the headquarters Fit Factory, Trout says, other remote locations are now involved with smaller scale fitness facilities.

The last of the three parts is aimed directly at costs. Embedded in the flexible benefits program are incentives and options to reduce the expense of medical care, such as a choice among seven different medical insurance plans and a health care expense account that is funded by an employee's before-tax dollars. In addition, employee contributions for medical coverage are on a before-tax basis.

Trout, like Keesee, is cautious about claiming tangible success. Whether or not his efforts can be credited, sick leave at the company has been reduced nearly two days, from an industry average of 7.3 days a year to 5.5 days in 1985. Also, despite rising health care costs, Portland General has been able to stabilize its medical expenses at $6.5 million for the last two years.

At Duke Power Company, a special effort has been directed at a segment of the workforce. Its thrust is to reduce chronic periodic absenteeism, explains Gail Addis, director of employee relations and services, who runs the appropriately named "Availability Improvement Program." Of the firm's 21,000 employees, three departments covering 1,500 people have used the program since 1984.

Essentially, workers whose attendance falls beneath a basic standard established among their peers enter a three-phase program, ultimately being asked to attend a series of six one-hour seminars. In the first session, employees learn how to do a trend analysis of their own attendance history so they can look at themselves as supervisors see them. Goals are set in a second session. In a third, the employees are taught some of the basics of good diet, exercise, and ways of reducing stress. Wellness is addressed in a fourth session, and in the final seminars, participants are asked to re-examine their communications styles and career/life plans.

"It's a 'no fault' approach," says Addis. "We don't assume the employees are absent when they really could be here. But there is a point in time when their own performance and the company's productivity are negatively affected."

Results have been positive, according to Bruce Emmons, Duke's manager of employee relations. Of the 57 people who participated in all three phases of the program during the first two years, chronic absenteeism declined 66 percent.

And while diplomacy and tact remain the hallmarks of Addis' approach to managing the program, the message to would-be goldbrickers is apparently clear enough. Attendance in the three departments where the program has been implemented has improved an average of 25 percent, a figure only achieved by fewer missed days among workers not directly eligible for the services. The word got out.

Essentially, because of a limited staff, the program has been aimed only at those in most need. But Addis believes the value of learning more about self-management is important to all Duke Power employees. "In a perfect world," adds Addis, "we'd offer the program to everyone."

Commonwealth Edison Company is representative of utilities now testing programs. It is in the midst of implementing one that sprang from labor/management

Carroll Seghers II/Uniphoto

Teresa Zabala/Uniphoto

Left:
A jogging track may encourage some employees to take a lunchtime break.

Below:
Smoking is a bigger health hazard than simply being on the job.

David M. Doody/Uniphoto

negotiations is 1982. In that year, a health awareness committee was formed to research and propose measures to reduce health costs. After drawing up a set of objectives, the firm hired Kathleen Archibald, a registered nurse, as director and appointed 24 health awareness coordinators responsible for administering and marketing the company program. This consisted of consumer education with a theme of "I'm in Charge." A group of medical plan changes were prepared for implementation in 1985. Cost-containment features included hospital pre-admission certification, expanded home health care, and an incentive program to encourage employees to audit their own hospital bills. Among the changes, Commonwealth Edison dropped its old medical insurer and engaged John Hancock Mutual Life Insurance Company. The health promotion and early disease detection component was inaugurated in 1986 and has focused on educating employees that wellness is crucial to personal and family health.[12]

At Pacific Gas & Electric Company in San Francisco, the emphasis to date has been on health awareness. The Healthwise program has two themes—"You Can Buy Smarter" (the effective use of insurance options) and "You Can Feel Better" (taking care of yourself). An annual health fair, monthly talks on subjects from heart attacks to allergies, and seminars on how to stop smoking are all open to everyone. In addition, managers can use the "Physis" gym or listen to cardiologist Meyer Friedman of the city's Mount Zion Hospital talk about stress management. Friedman is the originator of the famous Type A and Type B personality classifications. His message is to remain calm. (And he claims that he's remodeled his own Type A personality into a Buddha-like Type B character so successfully that he's been stopped twice by police for driving too slowly.)[13]

Oklahoma Gas and Electric Company recently experimented with its first health promotion program, reports Rob Thompson, coordinator of occupational health. Last winter, it offered smok-

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One's own behavior—eating habits, exercising, smoking, drinking, working, relaxing—may have more impact on one's life expectancy than genetics.

ing cessation classes, run by a local hospital. Smokers attended five 90-minute classes after work for a week. The lessons focused on the hazards of smoking as well as on tools for quitting. "We'll consider it a success if we get 50 percent of the people to give up cigarettes."

There's no doubt that the money paid to the hospital for the classes (there was no fee for participants) was cost-effective, says Thompson.

"Employees do more damage to themselves by smoking than by exposing themselves to the hazards of just being at work," he adds. Oklahoma Gas and Electric is also considering other wellness programs to be offered in the future.

Other utilities have health promotion programs, some more, some less expansive. But a great many have no programs at all. Several utilities contacted could point only to the company softball team or to an aerobics class sponsored by the social committee.

As seen from this brief survey, the design of utility health promotion programs is as diverse as their numbers. While some are aimed at cutting health care insurance costs, others are intended to resolve chronic absenteeism, while still others are considered a perquisite for recruiting and retaining employees.

Some ideas are harder to sell than others. While some programs such as Southern California Edison's stop-smoking and cancer detection services sell themselves, some administrators confront skepticism with other programs.

At Commonwealth Edison, managers have yet to conclude that wellness programs are a vehicle for saving money. "Though the long-term goal of wellness is better health and less chronic illness, it is not considered an immediate solution to containing medical costs," explains a recent article in *The Edison*, the firm's magazine. Instead, improving health care consumerism is the first step in arresting costs, according to vice president Pat Sanders.[14]

But most program coordinators are convinced that health promotion efforts are inevitable. "There's enough evidence out there to show that the programs are worth it," says Oklahoma's Thompson. "There's a $2 or $3 return on every dollar put out."

Agrees Commonwealth Edison's Sanders, "In the big picture, wellness is the direction health care is going. It has the triple benefits of keeping employees healthy, making the workplace better, and containing health care costs.

Starting a Program

To establish a health promotion program, there are any number of resources to draw upon. Good ones might include other companies both within and without the electric utility industry who have experience to share, the Washington Business Group on Health, the President's Council on Physical Fitness and Sports, and the Association for Fitness in Business. The Association for Fitness in Business, for example, has created a guide called the "AFB Information Directory and Resource Guide" that provides a 'yellow pages' of service providers. The association also has a career education program information service. The computer-based system maintains a registry of fitness professionals throughout the country. Detailed job descriptions are sent to prospective fitness experts to solicit their resumes, which are, in turn, forwarded on to the company.

The association outlines a plan in establishing a health promotion program. To begin, the firm should define its goals. If lower health care costs are the principal objective, that might involve a program different than one aimed at improving morale or reducing absenteeism. Hiring a consultant can be worthwhile. (Consultants certainly think so.)

Feasibility research comes next. Potential program providers can actually do such a study, which would not only give the firm information but also competitive prices. Surveying employees is a wise and probably necessary method for testing the acceptance of and designing a program.

If a facility is a component of the program, it must be carefully planned. Common errors include misjudging or failing to judge peak use; overcrowded gyms are hardly pleasant. And gyms are expensive to build. A less expensive way to encourage employees to exercise is to offer a discount at a local health club owned and managed by others.

Marketing the program is the last step. Some employees, especially those who don't work near the corporate headquarters, may not notice new jogging facilities or be aware of a health club subsidy.

In practice, designing and implementing a program is a delicate job that also involves corporate management. Convincing tight-fisted budget managers that building a gym is a means of reducing expenses could come across as a preposterous way for college recreation majors to get a job.

Health promotion programs shouldn't be launched lightly. "All too often, fitness programs are started with great fanfare, but no one bothers to collect the hard data that will help justify the program once the initial luster has worn off," notes Dr. Herbert.[15]

Evaluating a program involves its own art. Pitfalls abound. For example, individuals prone to cardiovascular disease might be the natural target of a heart attack prevention initiative. Yet, if they are vulnerable because of laziness, they may not opt to join an exercise class. Also, program directors whose jobs and compensation depend in part on the size as well as success of programs can interfere with objective assessment. Outside experts can also bring biases, since many may be health equipment vendors. As Dr. Herbert warns, "The literature on health care program evaluation methods is vast and confusing."[16]

Those associated with health promotion programs, including Dr. Herbert, nevertheless endorse the concept. All are convinced that healthy workers are productive workers and that in the end it shows on the company's bottom line. ■

Notes

1. "Health and Fitness: The Corporate View," collection of articles from *Athletic Business* magazine, no date, p. 2. Reprints available from Employee Fitness Report, Box 741, Cedar Rapids, Iowa 52406.

2. *Ibid.*

3. *Prudent Purchase*, University of California, San Francisco, Institute for Health Policy Studies, for the Office of the Assistant Secretary for Planning and Evaluation, U.S. Department of Health and Human Services, p. 7.

4. "Not Even These Guys Face a Bigger Deficit than Company Retirement Health Care Plans," advertisement by NWNL Group (division of Northwest National Life Insurance Company, Minneapolis, Minnesota).

5. "Commonwealth Edison's Strategic Plan for Medical Cost Management," October 31, 1985, signed by Kathleen Archibald, R.N., Employee Health Education, Commonwealth Edison Company, Chicago, Illinois.

6. "Physical Fitness Program," National Aeronautics and Space Administration, Office of Occupational Health, p. 3.

7. Survey by U.S. Chamber of Commerce, Clearinghouse of Business Coalitions for Health Action.

8. "American Business Gets Fit," Special Advertising Section, *Business Week*, October 7, 1985.

9. Dr. Henry R. Herbert, Leslie Montgomery, and Dr. Harry P. Wetzler, "Planning a Fitness Program for Industry," unpublished paper, p. 8. Authors are faculty members of the Department of Preventive Medicine and Biometrics, Division of Environmental and Occupational Health, Uniformed Services University of the Health Sciences, Bethesda, Maryland.

10. "Commonwealth Edison's Strategic Plan for Medical Cost Management."

11. *Prudent Purchase*, pp. 29-32.

12. "Commonwealth Edison's Strategic Plan for Medical Cost Management."

13. Gene Bylinsky, "The New Assault on Heart Attacks," *Fortune*, March 31, 1986, p. 88.

14. "Wellness is Catching (On)," *The Edison*, Commonwealth Edison Company, Communication Services Department, Chicago, Illinois, Fall 1985, p. 11.

15. Dr. Henry R. Herbert, Leslie Montgomery, and Dr. Harry P. Wetzler, "Planning a Fitness Program for Industry," p. 8.

16. *Ibid.*, p. 7.

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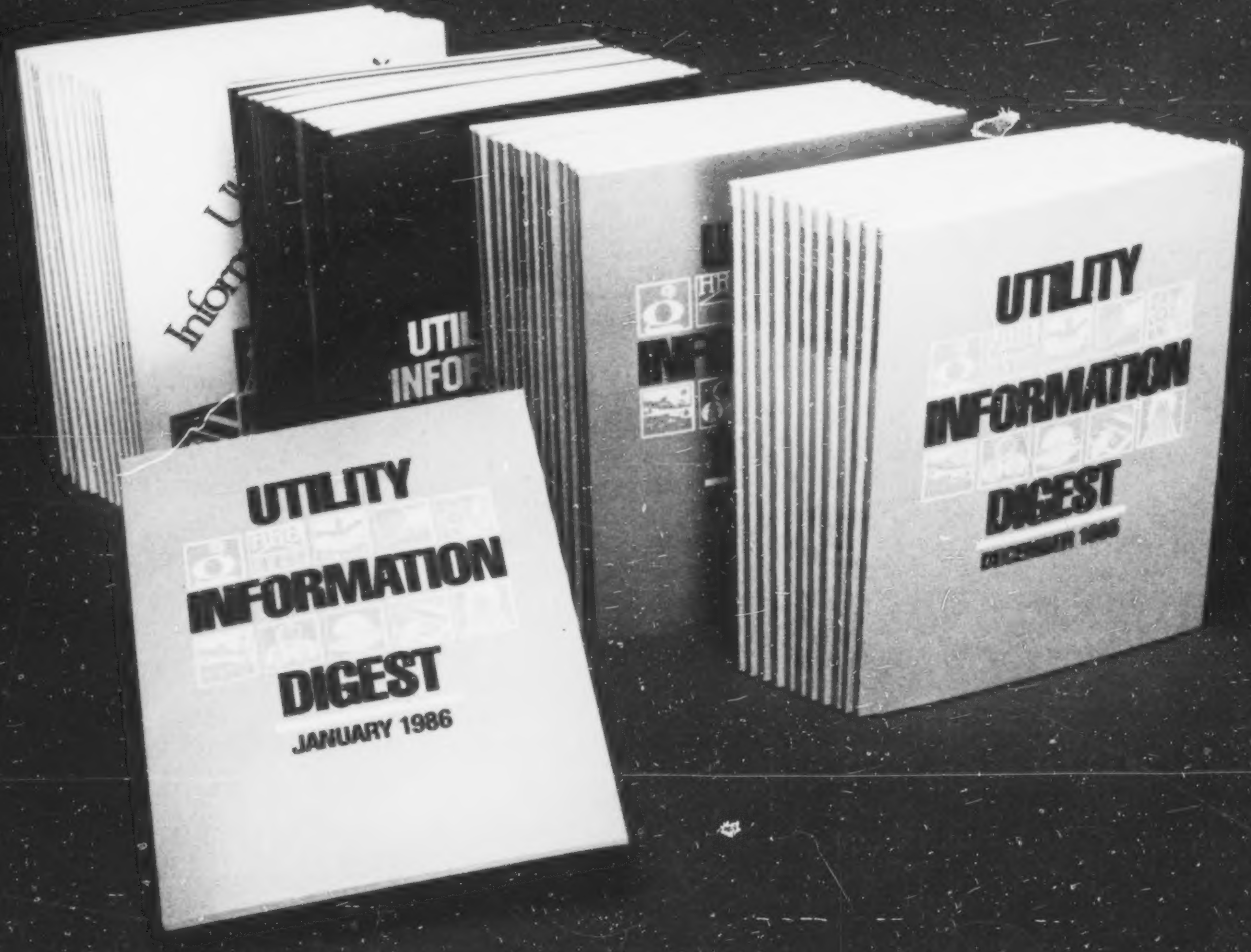
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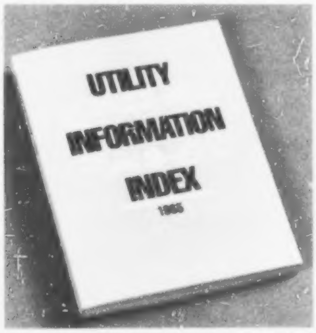

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REGULATORY REVIEW

CHANGING FASB STATEMENT #71 WON'T HELP UTILITY ACCOUNTING

The Securities and Exchange Commission (SEC), established in 1934, is authorized to prescribe for accountants the standards to be followed in the preparation of financial statements, balance sheets, and income statements that are filed with the SEC in accordance with existing securities law. However, the SEC has delegated to the accounting profession the responsibility of deciding what in fact constitutes proper accounting methods.

Thus, through the American Institute of Certified Public Accountants (AICPA), the accounting profession formed the Accounting Principles Board (APB) to establish accounting standards. The APB prepares and issues opinions on a variety of accounting issues. The opinions form accounting principles or standards that constitute generally accepted accounting principles or GAAP. Accounting for electric utilities must conform with GAAP. However, particular standards for particular utilities have been developed. In 1962, the APB issued an Addendum to APB Opinion No. 2 to cover the differences in the application of GAAP for regulated industries caused by the economic effects of regulation.

In 1973, the APB was replaced by the Financial Accounting Standards Board (FASB), which is completely independent of the AICPA. The FASB has the authority to declare and maintain the standards governing the accounting profession. Each standard is called a Statement of Financial Accounting Standard (SFAS). Before an accounting pronouncement becomes a statement, it has to go through lengthy deliberations, which include comments to a Discussion Memorandum, a public hearing, and additional comments to an Exposure Draft of the final statement. The resulting SFAS then becomes the standard used to apply GAAP. To date, the FASB has issued a total of 88 statements. In 1977, the FASB reviewed the Addendum to APB Opinion No. 2 and after lengthy deliberations issued SFAS#71, "Accounting for the Effects of Certain Types of Regulation" in December 1982, effective January 1984. It recognizes the unique economic aspects of the utility industry.

For the past 20 years, such specially-designed financial accounting rules for regulated enterprises have acknowledged the economic impact of regulators' actions. Now after only two years of being in effect, the FASB has begun to review the standard and has issued an Exposure Draft (ED) to amend it. The Edison Electric Institute (EEI) sees no pressing need to amend this standard so soon after its implementation. It is EEI's position that the accounting and reporting requirements of the existing standard provide utilities with sufficient guidance for reporting the economic effects of regulation and, therefore, the proposed amendments are unnecessary.

It is most important that the FASB carefully consider the complexities inherent in the regulatory process. All utility rates are cost-based. However, each rate decision reflects the regulator's evaluation of a massive and technical case record, and the decision rendered is specific and unique to the individual company. It is this regulatory process that creates the economic effect to be reported in financial statements. EEI believes that rather than *reporting* the economics of regulation, the proposals contained in the ED will *create* economic effects, in many instances in direct conflict with the economic effect intended by the regulator.

EEI does not favor the arbitrary time limit of ten years for the recovery of all costs deferred in phase-in plans as proposed in the ED. Under this criteria, most phase-in plans presently in effect would not be acceptable. *Probability* of recovery is the key issue and is more important than the recovery time period. It appears to be inconsistent to require the completion of a rate phase-in plan within ten years but allow the recovery of plant investment through depreciation over the useful life of the plant.

The capitalization of carrying costs during a phase-in, EEI believes, is proper and justifiable for the same reasons that allowance for funds used during construction is proper during the building period. If the regulator provides reasonable assurance of future recovery of the carrying costs, then an asset exists.

We agree with the FASB's criteria that disallowed recovery of abandoned plant costs should be written off. We do *not*, however, agree with the discounting concept. The FASB's ED states that if recovery of abandonment costs is allowed in rates, but with no return, the asset should be discounted to its present value. The discounting concept departs significantly from GAAP, distorts the results intended by the regulator, and violates the principle of matching revenue and expense. It should be examined for consistency in application to other industries and studied in a more generic format.

FINANCIAL REVIEW

The FASB in the ED is also proposing that a regulator's disallowance (imprudency) of part of the cost of a newly completed plant should be recognized as a loss. This proposed change would cause a significant charge to income in the year of a cost disallowance. Under GAAP, no write-off is required for a disallowance if it is probable that the revenues to be collected, including an equity return on the allowed portion, are sufficient to recover the total cost of the facility, including the disallowed portion, and associated ongoing interest costs. EEI believes that regulated industries should not be treated differently.

The retroactive implementation of these proposed changes is unconscionable. We have stressed the need for an orderly prospective transition of any amendments to SFAS#71. Without this orderly transition, the retroactive proposal, in certain instances, could have significant impact on existing dividends, the issuance of new debt, and some companies' ability to sustain their financial integrity. Changing accounting principles after the fact could have substantial financial and legal consequences.

The application of the standards of SFAS#71 requires the exercise of informed judgment on the part of utility managements and their independent auditors. We do not believe the FASB's goal should be to develop standards so finite that all possible circumstances are defined and prescribed. *EP*

Contributed by the Accounting Department of Edison Electric Institute.

EARNINGS DOWN SLIGHTLY

Investor-owned electric utilities' earnings per share declined slightly from the $3.03 earned in 1984 to $3.01 in 1985 (excluding extraordinary items) on a 3.5 percent increase in electric operating revenues (see Table 1). The additional revenues generated by recent rate increases and a kilowatt-hour sales increase of 1.9 percent in 1985 were not enough to overcome a 3.4 percent increase in operating expenses and interest charges and a 3.8 percent increase in the average number of common shares outstanding. Earnings per share were down 0.7 percent in 1985. Although the number of shares outstanding increased, common stock equity as a percent of capitalization remained a constant 41.1 percent for both 1984 and 1985. The return on average common equity dipped to 13.8 percent in 1985, from 14.4 percent in 1984.

The continuing downswing in the construction cycle, in conjunction with additional plants being put into service and plant write-offs, is responsible for the reduced amount of allowance for funds used during construction (AFUDC) (non-cash accruals for construction period financing costs) recorded in 1985. The combined debt and equity components of AFUDC dropped 3.1 percent from $8.2 billion in 1984 to $8.0 billion in 1985. Construction work in progress (CWIP) decreased 6.5 percent from $95.5 billion at the end of 1984 to $89.3 billion for 1985 (see Table 2).

Although earnings per share were down slightly, the quality of the earnings recorded during 1985 continued to increase as the percentage of AFUDC in net income available for common (excluding extraordinary items) fell from 48.7 percent in 1984 to 45.8 percent in 1985. An increased quality of earnings is also reflected in pre-tax interest ratios. Pre-tax interest coverage without AFUDC increased slightly from 2.54 times in 1984 to 2.55 times in 1985.

Operation and maintenance expenses dropped 2.4 percent in the fourth quarter, from $8.1 billion in the last quarter of 1984 to $7.9 billion in the last quarter of 1985, as industry cost containment programs made their impact felt (see Table 1). The drop was the first since the quarterly survey was instituted in 1977.

Further good news was noted as expenditures for fuels declined slightly during 1985. Fuel prices started to turn the corner during the second quarter of 1985 when the industry recorded a 1.1 percent decline in expenditures for fuel. By the close of the year, this trend had gained additional momentum as the OPEC cartel's grip on world oil prices started to loosen and prices began to plummet. Although oil is used to generate only a nominal amount (5.5 percent in 1984) of the nation's electricity, the oil price decline placed additional downward pressure on the price of other fossil fuels used in the generation of electricity, i.e., coal and gas.

The $2.2 billion earned in 1985 by investor-owned electric utilities in non-utility operations was 3.8 percent higher than the $2.1 billion earned in 1984. Two companies chose to charge $434 million in plant write-offs against other

Table 1

Investor-Owned Electric Utility Industry Statement of Income

(Unaudited)
(Millions of Dollars)

	Three Months Ending December 31,			Twelve Months Ending December 31,		
	1985	**1984**	**% Change**	**1985**	**1984**	**% Change**
Total Electric Operating Revenues	$29,577	$29,065	1.8	$124,270	$120,090	3.5
Electric Operating Expenses						
Fuel	$ 8,796	$ 8,942	(1.6)	$ 37,031	$ 37,697	(1.8)
Other Operation & Maintenance	7,892	8,086	(2.4)	31,916	30,464	4.8
Depreciation & Amortization	2,711	2,407	12.6	10,316	9,250	11.5
Taxes Other Than Income Taxes	2,129	2,037	4.5	8,878	8,507	4.4
Income Taxes (Federal & Other)	960	826	16.2	5,369	4,562	17.7
Provision for Deferred Income Taxes	1,060	1,472	(28.0)	4,436	4,701	(5.6)
Investment Tax Credit Adjustment, Net	347	(27)	N.M.	2,077	2,113	(1.7)
Total Electric Operating Expenses	$23,894	$23,743	0.6	$100,023	$ 97,294	2.8
Electric Operating Income	$ 5,683	$ 5,322	6.8	$ 24,247	$ 22,796	6.4
Other Utility Operating Income	342	299	14.5	1,472	1,378	6.8
Total Utility Operating Income	$ 6,026	$ 5,621	7.2	$ 25,719	$ 24,174	6.4
Other Income & Deductions—Net	$ 252	$ 526	(52.2)	$ 2,216	$ 2,135	3.8
Allowance for Other Funds Used During Construction	1,189	1,356	(12.3)	5,029	5,155	(2.5)
Total Income Before Interest Charges	$ 7,466	$ 7,503	(0.5)	$ 32,964	$ 31,465	4.8
Interest Charges						
Interest on Long-Term Debt	$ 3,753	$ 3,617	3.8	$ 14,638	$ 13,540	8.1
Other Interest Expenses & Charges	245	275	(11.0)	1,005	1,293	(22.3)
Allowance for Borrowed Funds Used During Construction	(657)	(775)	(15.3)	(2,934)	(3,061)	(4.2)
Net Interest Expenses & Charges	$ 3,341	$ 3,117	7.2	$ 12,709	$ 11,771	8.0
Net Income Before Extraordinary Items	$ 4,125	$ 4,386	(6.0)	$ 20,255	$ 19,694	2.8
Extraordinary Items	(1,668)	(54)	N.M.	(1,669)	(22)	N.M.
Net Income	$ 2,457	$ 4,332	(43.3)	$ 18,586	$ 19,672	(5.5)
Preferred Dividends Declared	721	733	(1.6)	2,887	2,828	2.1
Net Income Available for Common	$ 1,736	$ 3,599	(51.8)	$ 15,699	$ 16,844	(6.8)
Common Dividends Declared	2,819	2,917	(3.3)	11,752	11,077	6.1
Additions to Retained Earnings	($ 1,083)	$ 682	N.M.	$ 3,947	$ 5,767	(31.6)
Avg. Shares Outstanding	5,870	5,668	3.6	5,777	5,565	3.8
Earnings Per Share Excluding Extraordinary Items*	$ 0.58	$ 0.63	(7.9)	$ 3.01	$ 3.03	(0.7)
Earnings Per Share*	$ 0.30	$ 0.63	(53.4)	$ 2.72	$ 3.03	(10.2)
Common Dividends Per Share*	$ 0.48	$ 0.51	(6.7)	$ 2.03	$ 1.99	2.2

*Based on average shares outstanding as reported to EEI by survey respondents and adjusted for stock splits.
NOTE: Revenues are adjusted for intra-industry sales for resale of electricity.
N.M.—Not meaningful.

Based on unaudited reports submitted by a sample of electric utilities which account for approximately 94 percent of the industry's revenues from sales to ultimate customers and 93 percent of the industry's total assets.

Table 2

Investor-Owned Electric Utility Industry Balance Sheet

As of December 31, 1985
(Unaudited)
(Millions of Dollars)

Assets	**1985**	**1984**	**% Change**
Utility Plant*			
Utility Plant (Including Nuclear Fuel)	$344,168	$307,179	12.0
Less Accumulated Depreciation	93,949	88,525	6.1
Total	$250,219	$218,654	14.4
Construction Work in Progress	89,281	95,491	(6.5)
Net Utility Plant	$339,501	$314,145	8.1
Investments	8,782	9,359	(6.2)
Current Assets	38,502	37,823	1.8
Deferred Debits	17,502	18,065	(3.1)
Total Assets	$404,287	$379,392	6.6
Capitalization & Liabilities			
Capitalization			
Common Stock	$ 85,776	$ 81,728	5.0
Retained Earnings	44,324	40,423	9.7
Preferred Stock	30,537	29,882	2.2
Long-Term Debt	149,797	141,693	5.7
Total Capitalization	$310,434	$293,726	5.7
Current Liabilities			
Short-Term Debt	$ 4,403	$ 5,454	(19.3)
Long-Term Debt Due Currently	6,392	3,631	76.0
Other Current Liabilities	28,130	27,765	1.3
Total Current Liabilities	$ 38,925	$ 36,851	5.6
Deferred Credits			
Accumulated Deferred Income Taxes	$ 31,580	$ 26,438	19.4
Accumulated Deferred Investment Tax Credits	15,469	14,136	9.4
Other Deferred Credits	7,879	8,241	(4.4)
Total Deferred Credits	$ 54,928	$ 48,815	12.5
Total Capitalization & Liabilities	$404,287	$379,392	6.6

*Includes non-electric utility plant.

Based on unaudited reports submitted by a sample of electric utilities which account for approximately 94 percent of the industry's revenues from sales to ultimate customers and 93 percent of the industry's total assets.

income during the fourth quarter of 1985, reducing the gain to moderate levels. On a per share basis, these charges against other income amounted to $.07 per share for both the fourth quarter of 1985 and the year.

Seven additional companies took charges against earnings for plant write-offs during the fourth quarter of 1985. Their losses of $1.7 billion were posted as extraordinary losses and on a per share basis amounted to $.28 during the fourth quarter of 1985 and $.29 for the year.

Fourth quarter 1985 earnings per share (excluding extraordinary losses) were down 7.9 percent from $.63 per share in the fourth quarter of 1984 to $.58 per share in the fourth quarter of 1985. Earnings, including extraordinary losses, were $.30 a share during the fourth quarter of 1985.

Contributed by the Financial Analyses and Activities Department of Edison Electric Institute.

TECHNOLOGY REVIEW

THE NEW WORLD OF TELECOMMUNICATIONS

Since the turn of the century, telecommunications technology has played an important part in electric utility system operations. The telephone, invented in 1876, became one of the primary tools used by the first electric utility system operators. To stabilize electrical service and accomplish frequency regulation, operators watched a frequency meter and used telephones to call for changes in power output from remotely located generating plants.

As increased electrification was accomplished, electric utility systems expanded and an increasing amount of data was needed in control centers. This data, including currents, voltages, and power flow measurements, was gathered and transmitted in analog form using lines leased from telephone companies. At the control centers, the data was displayed on banks of strip chart recorders arrayed around system operators.

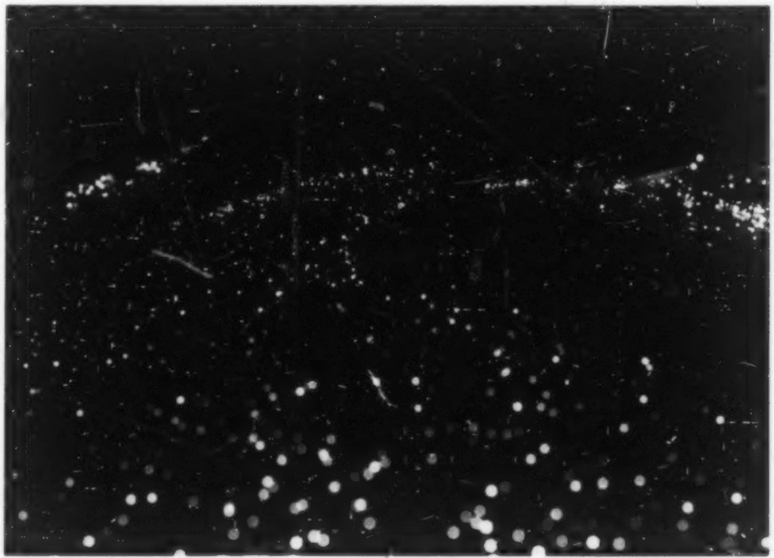
During the 1950s, electric utility companies recognized the tremendous benefits to be gained from using analog computer control systems in system operations. Telemetered data was fed into analog computers, and control signals were calculated and sent back out over leased lines to "automatically dispatch" generating units. Analog computer control systems made it possible to rapidly recalculate dispatching strategies, taking into account changes in generating unit heat rates, changes in fuel costs, and changes in losses resulting from changes in transmission system configuration.

Many electric utility control centers converted from analog to hybrid or all-digital computer systems in the 1970s. All-digital systems, which represent the current state of the art, gather data in digital form from remote terminal units by using leased line communications or microwave communications networks. Large digital computers process more data more rapidly and more reliably than analog systems and make it possible to perform many system security studies and operating economic evaluations using current system data.

Today, electric utility companies depend on telecommunications networks not only to provide data to control centers but also to communicate billing information to customer service centers, to determine the extent of customer outages after storms, to read meters, to provide internal telephone systems for employee use, and to provide services to other businesses. In addition to microwave and leased line communications, electric utilities make extensive use of cable and mobile radio communications for these applications.

Fiber optics and satellite communications are among the new transmission technologies being considered for future electric utility applications. Fiber optics is considered to be one of the most promising means of transmitting digital information over utility rights-of-way. Optical fibers can carry much more capacity with significantly lower overall circuit mile costs than other transmission technologies.

The new optical and digital technologies that are becoming available can serve as a basis for bringing all operational data into a



Jeff Zaruba Folio, Inc.

Fiber optics can carry digital information cheaply over utility rights-of-way.

single data base. Future telecommunications networks will make it possible to integrate load management and distribution automation objectives. Utilities will be in a better position to monitor substation distribution breakers, respond to customer needs, and shape loads by controlling distribution feeders. Realizing these objectives will require a "systems approach," effectively integrating smart remote terminal technology, state of the art telecommunications networks, and associated computer hardware and software.

All future telecommunications activities will be profoundly affected by the divestiture of the American Telephone and Telegraph Company (AT&T) that became effective on January 1, 1984. This extremely important event has forever changed the structure of the U.S. telecommunications industry and has created many new challenges for electric utilities. Under the terms of the divestiture, electric utilities and other telecommunications users have taken on new responsibilities for designing systems and/or purchasing equipment. Many electric utilities have reorganized and are training personnel to respond to these new responsibilities.

Some electric utility companies are forming subsidiary companies that will offer telecommunications services. There is a growing market to provide computer networks, video and television communications systems, and facsimile services. In the future, significant opportunities will exist for electric utility companies to sell rights-of-way and capacity on fiber optic and microwave systems to other users and other companies offering telecommunications services. EP

Contributed by the Engineering Department of Edison Electric Institute.

STATISTICAL REVIEW

STOCK OWNERSHIP: WIDOWS & ORPHANS?

Electric utility common stock has traditionally been heralded as stock suitable for ownership by widows and orphans. In truth, only a small percentage of electric utility common stockholders could be categorized in such a manner. A more realistic approximation of the typical electric utility common stockholder was derived by aggregating the results of 16 investor-owned electric utilities' shareholder surveys. The results of this "shareholder profile" are presented in Table 1.

As the table indicates, electric utility shareholders tended to be older, with slightly more than half of the respondents over the median age of 65 years. The 54 percent of respondents who listed their current employment status as "retired" helped reinforce previous indications that the typical electric utility shareholder was elderly and retired.

Although the majority of shareholders were older and retired, the group's median income of $35,500 was above the national average and above the $33,200 recorded in the New York Stock Exchange's survey, *Shareownership 1983*. The bulk of shareholders, or 44 percent, had an annual income between $20,000 and $50,000, while 29 percent had income above $50,000 and 30 percent had income under $20,000. This illustrates that investors with a variety of income levels participated in the ownership of electric utility common stock.

Married individuals accounted for 64 percent of shareholders in the profile. Consequently, it is not unusual that 32 percent of accounts were jointly held and that those accounts held individually were equally divided between the sexes.

Education was an important demographic characteristic of the survey participants. On a whole, they comprised a well-educated group, with over 50 percent having attended at least some college and 37 percent going on to complete college or post-graduate work. Only 30 percent had completed high school or less.

Electric utility stockholders are long-term investors. On average, they have held between 100 and 500 shares for over five years. They held these shares primarily for dividend income, and 39 percent of individuals chose to reinvest those dividends.

Although the profile indicates that electric utility stocks are primarily held for dividend income, shareholders have also experienced good price performance. During 1985, electric utility stock prices, when adjusted for dividends, appreciated over 30 percent. This approximated the combined dividend and price performance of the S&P 500 for the year. Accordingly, institutional investors have taken advantage of the situation and probably contributed to it by increasing their ownership over the past years from 19 percent at year end 1983 to an estimated 25 percent at the end of 1985.

Contributed by the Financial Analyses and Activities Department of Edison Electric Institute.

Table 1

Comparison of Shareholder Surveys

Items	Electric Utility Industry Average of Shareholder Surveys**	New York Stock Exchange's Survey "Shareownership 1983"
Age:		
Median	65	46
Less than 45	17%	48%
Between 45 & 65	33%	34%
More than 65	53%	18%
Employment Status:		
Retired	54%	17%
Employed	40%	68%
Other	6%	15%
Income:		
Median	$35,500	$33,200
Less than $20,000	30%	22%
Between $20,000 & $50,000	44%	57%
More than $50,000	29%	21%
Gender:		
Male	47%	48%
Female	47%	52%
Joint Accounts	32%	Removed
Percentage of Stockholders Who Reinvest Dividends:	39%	*
Marital Status:		
Married	64%	71%
Single	11%	14%
Divorced/Widowed	23%	15%
Other	2%	*
Length of Ownership:		
Less than 1 Year	10%	*
Between 1 & 5 Years	37%	*
More than 5 Years	52%	*
Percentage Holding for Dividend Income:	52%	*
Shares Held:		
1-100	30%	*
100-500	53%	*
500 +	16%	*
Education:		
High School or Less	30%	28%
Some College	18%	26%
College or Post-Graduate	37%	37%
Other	15%	9%

*Indicates that comparable data was not available.

**Averages when summarized by category may not equal 100 percent since averages were developed independently.

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BOOK REVIEW

ENERGY UNBOUND: A FABLE FOR AMERICA'S FUTURE

L. Hunter Lovins
Amory B. Lovins
Seth Zuckerman
Sierra Club Books, 1986
San Francisco, California, 400 pp.

Reviewed by C. D. Everhart

A fable, in Webster's definition, is "a fictitious story meant to teach a moral lesson . . . the characters are usually talking animals."

To appreciate the fable atmosphere in *Energy Unbound*, by Amory Lovins, his wife (L. Hunter), and Seth Zuckerman, the scene must first be set. Visualize, if you will, a middle-aged housewife from Dubuque, Iowa, whose adult life has been largely devoted to being a mother/PTA volunteer/bake sale chairman/car pool organizer and driver for neighborhood children. With her youngest child now a senior in high school, Eunice Bunnyhut wants to "earn some money" rather than spend the rest of her life as a volunteer worker. Also, her husband is "between jobs." An ad in her local newspaper for a person with "common sense and good judgment sought to manage a small team" leads to an interview and later a meeting with the Special Assistant to the President (that's the President of the United States). A short time later she finds herself riding in a limousine down Independence Avenue in Washington, D.C., toward the Forrestal Building to her first day on the job as Secretary of the U.S. Department of Energy.

Secretary Bunnyhut has scheduled a 9:30 a.m. meeting with her eight Assistant Secretaries. Walking down the corridor following the meeting she feels confused and distraught by the conflicting statements and technical recommendations her deputies have made. "How," she wonders aloud, "did we ever get into this mess? Energy never used to be such a problem."

Passing an open doorway, she hears, "You're new around here, aren't you?" The question comes from Duncan Jefferson Holt—late thirties, aviator glasses, faded blue jeans—fully aware of who she was. After exchanging a few more words, he offers to enlighten her—"a bit, if you'd like me to. Who knows, you might even have an open mind, and that really would be a treat to discover around here." He invites her into his office, which is cluttered with reports and reference works piled high on government-issued furniture.

Though there are no talking animals in this fable, it soon becomes apparent that Duncan Jefferson Holt could hold his own against a horde of the jungle's most articulate inhabitants. Beginning on page 11, he launches into a week-long monologue, explaining to the new Secretary of Energy the ins and outs of the energy situation according to the Lovins gospel. He doesn't stop talking until the book's final pages when he is suddenly called out of town on Department business.

While it is never said, Holt appears to be a middle-level DOE bureaucrat, a term he would never apply to himself. He has the air of an elitist, a frustrated intellectual with encyclopedic knowledge seeking an audience, and a down-the-nose attitude toward DOE personnel.

Initially somewhat awed by his vast store of information, Mrs. Bunnyhut soon begins to voice her reactions and to question his statements ("Do you really mean that I could get a refrigerator that uses *no* electricity . . . except for the light that goes on when the door is opened?")

While Mrs. Bunnyhut spends her first week in his office, her secretary covers for her, inventing White House meetings, briefings, and other appointments to fend off the curiosity of her Assistant Secretaries.

Scriptures from the Lovins soft energy path philosophy, as enunciated by Holt, portray a society running on sun and water power, windmills, wood, manure, peach pits, and walnut shells. Tens of thousands of tiny energy sources would replace the country's power plants. In the process, Americans would largely become a nation of Do-It-Yourself craftsmen and craftswomen, installing their own solar devices and building wind machines with hand tools. Light bulbs would burn for 10,000 hours and automobiles would be getting 80-to-100 miles per gallon.

This is not to say that *Energy Unbound* does not contain any practical and useful advice such as weatherizing homes and taking advantage of up-to-date, energy-efficient appliances. On a larger scale, the book points to past mistakes and miscalculations by utilities, economists, and planners both in and out of government that have resulted in waste and inefficiency. As one might expect in Lovins' writings, nuclear power comes in for some strong criticism. As Holt forecasts to Mrs. Bunnyhut, nuclear plants "will probably stand as steel and concrete monuments to a future technology whose time has passed."

In the chapter, "Doing More With Less," Holt discusses improvements that could be made in electric motors used in industrial processes. Mrs. Bunnyhut asks what energy savings would result. He replies that "a dozen or so refinements will more than displace the entire nuclear power program . . ." It is upon hearing statements like this that the reader has to keep in mind that, yes, this book is a fable.

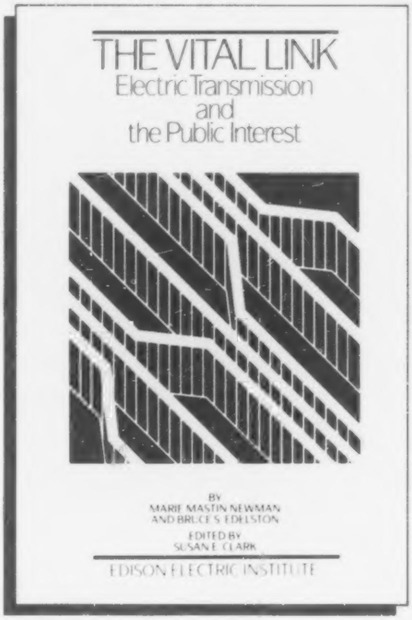
The Lovins/Holt doctrine leaves little room for conventional sources of energy. The soft energy path, as depicted in the chapter "Renewables to the Rescue," is the road to follow. As Holt says at one point, "In the future, all we will ultimately need will be sustainable sources of energy, and no depletable ones." Perhaps, but the question is when—the twenty-third century?

The role electric utilities should play is described this way: "Utilities have to . . . realize that they are not just supplying kilowatt hours—they are supplying energy services. The cheapest way of providing more energy services is to invest in efficient refrigerators, light bulbs, motors, et cetera. Now, either the utilities are going to help customers make those investments, or the ratepayers are going to turn their backs on the utilities, make those investments without them, and let the utilities rot with their uselessly expensive power plants." Acknowledging that the latter option would be unfortunate, Holt concedes that "basically, utilities are decent organizations with decent people working for them. If the utilities go broke, they'll take a lot of good people down with them and conceivably even the whole financial system."

He goes on to point out that some utilities are helping customers to make investments in energy improvements, such as insulating attics, offering low-interest or no-interest loans and rebates on purchases of efficient appliances, and paying cash to customers according to the amount they reduce electric usage during peak-load periods. "Remember," he tells Mrs. Bunnyhut, "the alternative to the installation of an energy-efficient appliance is the utility's investment in an uneconomic power plant."

No one argues with efficiency, nor with burning garbage and other cast-off material to produce electricity when such processes prove cost-effective. The larger question, however, is: As America approaches the twenty-first century, are we willing to adopt a Good Old Days society that derives its energy from piecemeal and in some cases unreliable sources? In the last 200 years, America and many other nations have emerged from the rugged individualistic

THE WHEELING DEBATE: WHAT'S AT STAKE?


THE VITAL LINK
Electric Transmission and the Public Interest
BY MARIE MASTIN NEWMAN AND BRUCE S. EDELSTON
EDITED BY SUSAN E. CLARK
EDISON ELECTRIC INSTITUTE

Reliability? Safety? Efficiency? Costs? Fairness?

The Vital Link: Electric Transmission and the Public Interest explains this complex issue in lay terms, giving the reader all the background information necessary to understand the debate on mandatory wheeling and its potential impact on utility customers both large and small.

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◆ describes the current voluntary system of bulk power exchange
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◆ presents the electric utility industry's views on the evolving debate
◆ reviews emerging efforts to improve efficiency and reliability within the existing system
◆ suggests additional ways the industry and its regulators can work together to improve the system

Written by Marie Mastin Newman, a communication consultant formerly with EPRI, and Bruce S. Edelston, EEI's Director of Public Policy Analysis, *The Vital Link* is available for only $5. Write for your 48-page copy today. Specify publication 07-86-08. *Member-company price is $4.* Make checks payable to Edison Electric Institute.

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Do-Everything-Yourself way of life. The long, tortuous days of chopping firewood and washing clothes by hand are far behind us. This is not to suggest that *Energy Unbound* proposes a 180° turn, but the philosophy embodied in the soft energy path contains elements of a society that Americans have long since seen slip happily into history.

Eunice Bunnyhut has reached the end of her first week on the job. With her transition from housewife to a Cabinet Secretary complete, she is now ready to present her newly-formulated energy policy to her Assistant Secretaries. Facing her staff, she outlines a set of actions. Among them are eliminating government subsidies for all energy technologies; adopting a free-market policy to ensure that people have the incentive and opportunity to choose among energy options; revamping research and development programs including reduced expenditures "for the least-needed form of energy, electricity;" stepping up solar research; retraining people in energy specialities "we no longer need" such as nuclear power; assisting inefficient and obsolete factories in retooling; and transfering the nuclear bomb program out of the Department of Energy (where it will find a home is not among the Secretary's proposals).

When Mrs. Bunnyhut finishes, one Assistant Secretary exclaims, "You can't do any of this. It will never fly in Congress or before the people and it certainly will not make it in this Department."

She replies that she has already received approval for her program from the Special Assistant to the President and key members of Congress. Then she adds, "As to whether my policies will fly in this Department, you should know that it is not my plan that will fly or drop, but my staff."

Whose policy *will* "fly" or "drop" as Americans face increasingly complex energy choices? The answer, it seems to this reviewer, is "none of the above." Decisions to be made will be derived from an ever-widening range of policies and interests—utilities, energy producers and innovators, government, and the Lovins/Zuckermans who have set down their path in *Energy Unbound*. Cop-out? We'll see.

C. D. Everhart, a former public relations executive, is now a freelance writer.

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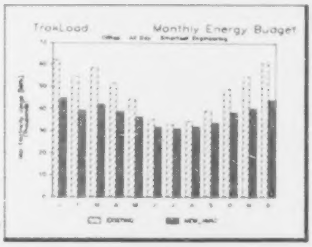

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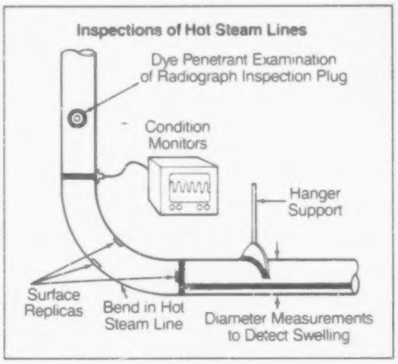
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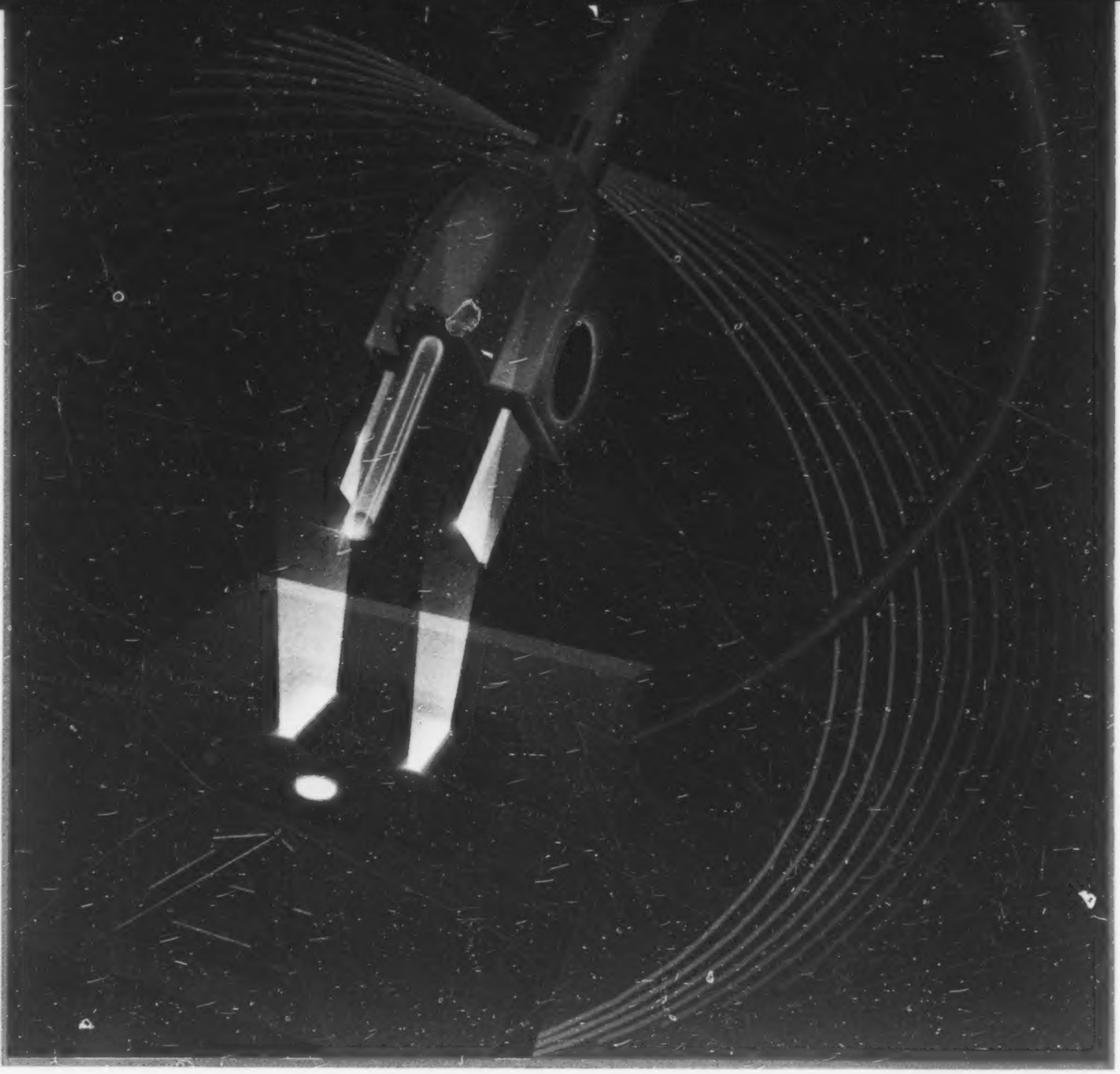

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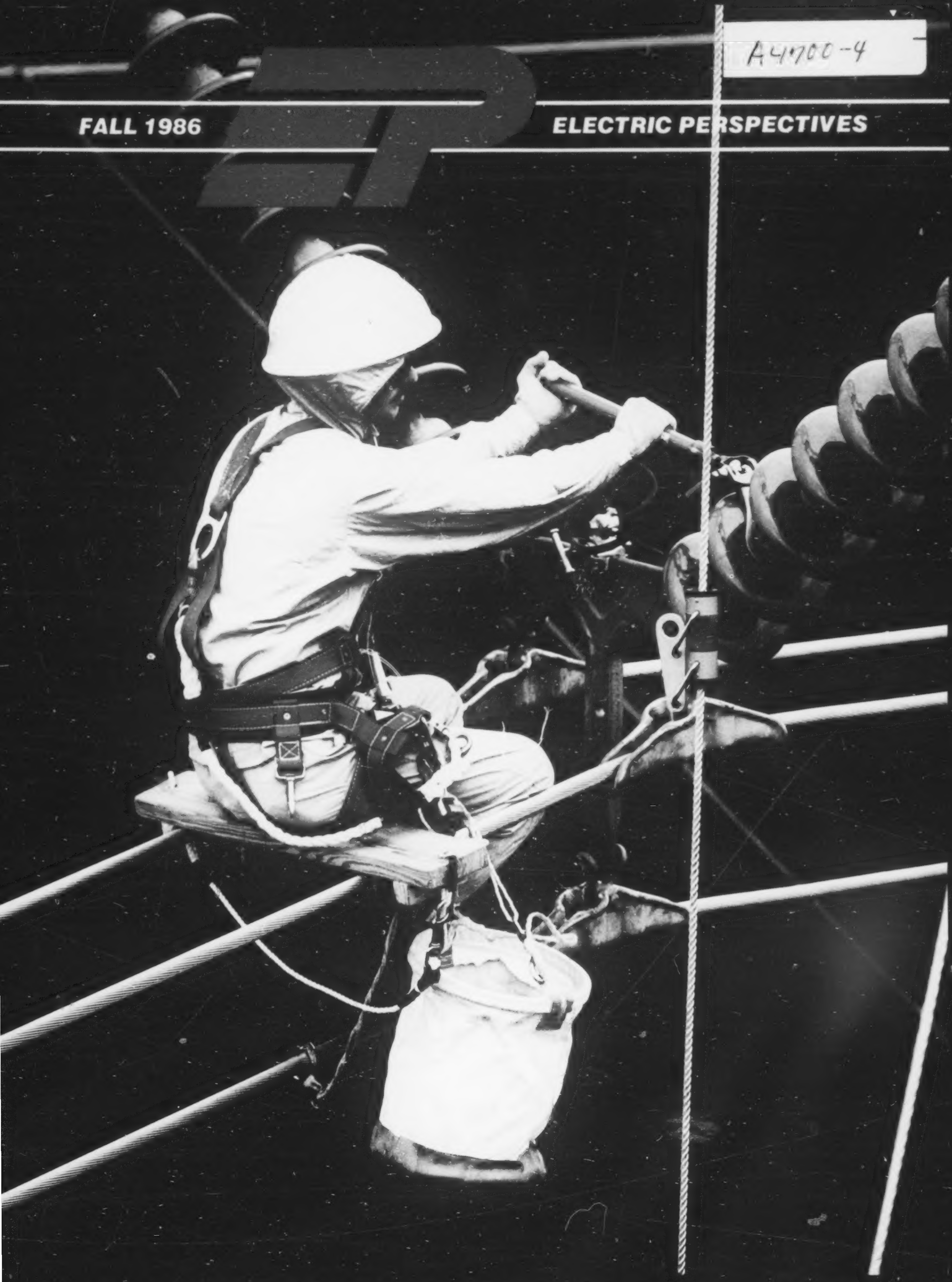
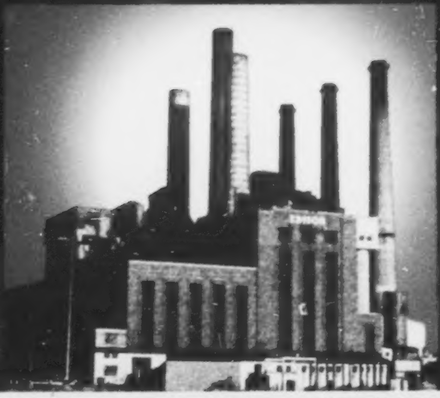
ELECTRIC PERSPECTIVES





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Modern's non-theatrical division has, since 1937, been the world's largest distributor of sponsored films and video programs. Using the latest computer technology to access the audiences and demographics each client wants, these film prints and videocassettes exceed two million bookings annually from an inventory of more than 7000 active titles. Sponsored film and video programs are recognized as one of the most effective means of transmitting high-impact, complete-story information to massive audiences across the country and around the world.

Modern's communications division is a full-service Public Relations organization, designed to provide any client with a complete range of public affairs, PR and communications capability focused on individual need — whether long-range counsel and programming or a single project. This Washington, D.C. based division, with the support of Modern's complete corporate capability, will audit, plan, budget, implement and evaluate PR program services utilizing any communicating device appropriate to the client's needs.

Modern's "Concepts" is the award-winning division responsible for turning ideas into reality. An organization of artists, writers and production staff ensures high quality material innovatively designed, presented and produced on deadline and in budget. The Concepts staff offers a full range of creative service, with the added advantage of having the creative, production, distribution and follow-up facilities in one place.

Modern's satellite services division creates tailor-made magazine-format programming for sponsored film and video broadcast to a cable audience of more than 23 million. The delivery of these packages is through an agreement with Financial News Network and The Learning Channel, both acclaimed for their educational and informative programming. The "MSS Specials" are presented in any length for each sponsor's program, and are in a stand-alone format. The delivery system is a cost-effective way to reach millions of cable viewers with related interests.

Modern video programs division is a special distribution service for TV titles. This distribution network utilizes one-hour film or video programs specifically distributed to cable stations. By creating the 60-minute format programs, cable systems sets up a regular airing for MVP, and subsequently, your program. The division will also distribute single titles to cable systems.

Modern's TV division is a clearinghouse and distribution center for the television placement of sponsored films and videotapes. The nation's broadcasters depend upon MTV as the primary source of sponsored programs to fill public service needs, address special subjects, and round out regular air time. Distribution, including the placement of Public Service Announcements into hundreds of TV markets, reaching broadcast, low power, and cable systems.

Modern Cinema 35 provides bookings of short subjects in some 9500 theaters throughout the country to attentive audiences under optimum viewing conditions. These short features offer strong entertainment and product values, and Modern works with each client's sponsored film product to ensure that subject material is both suitable and in the appropriate context with regular theater feature programming.

Modern's library management service fulfills the educational aids requirement of a company or association, including the distribution of AV and printed materials designed for specific audiences. Distribution by the AV Library can be on the basis of free-loan, rental, or sale.

Modern's videotape duplication service represents state-of-the-art capability for either large-volume or on-demand duplication of [illegible] VHS or Beta formats or [illegible] tape editing and 16mm film-to-tape transfers. Using the latest Microtime and Fortel time-base correction and image-enhancing equipment, Modern's duplicating service makes message reproduction quickly available, affordable, and easily acceptable.

Modern's College Cinema division brings quality entertainment to campuses throughout the country by providing a complete package, including projector, screen and films. Sponsored films are shown to well attended gatherings of college students, and titles are usually repeated two or three times each semester. College Cinema operates in the Fall and Spring semesters on more than 124 campuses.

Modern's resort and campground cinema division distributes sponsored film through "circuit directors" who travel the resort belt providing new films, checking on equipment, instructing operators, and collecting show reports for film-owner clients. Resort audiences are usually along shorefronts, lakesides and in the mountains.

Modern's ProEducation magazine, published quarterly during each academic year, is a vital link to the educational community, keeping business, government and the professions informed about educational activities involving the sponsorship of resources, programs and partnerships for education. This includes grants, scholarships, printed and audio-visual materials, adopt-a-school programs, and organized projects such as junior achievement, executive loan programs and sponsorships providing time, materials or financial support to education. ProEducation has a controlled circulation of 39,000 to secondary school principals, district curriculum directors and the CEO's of America's top 1500 companies.

Of more than 500 Modern clients, some of those representing the U.S. electric power industry are:

American Coal Ash Association, Atomic Industrial Forum, Inc., Baltimore Gas & Electric Company, Boston Edison Company, Consumers Power Company, Duke Power Company, Duquesne Light Company, Edison Electric Institute, Georgia Power Company, National Rural Electric Cooperative Association, Ohio Electric Utility Institute, Pacific Gas & Electric, Potomac Electric Power Company, and Virginia Power.

. . .And next year, in 1987, Modern will celebrate 50 Years of Service to America's Industries, Associations and Governments.

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50 YEARS

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A PERIODIC REPORT FROM BURNS AND ROE FALL, 1986

Burns and Roe can help your utility's security become state of the art

The terrorist slips through an unlocked gate and onto utility property. He sets the timers on two large bombs and puts them at critical points near the power plant, then leaves. Both bombs explode, and the resulting fire injures a dozen employees and forces shutdown of the plant.

It's a worst-case scenario, of course, and it hasn't happened yet. But the number of bombings in the U.S. and its territories is approaching 1,000 a year; each year, industrial companies lose more than $3 billion to theft, sabotage and vandalism.

It is only a matter of time before a power plant or other utility facility suffers a major attack, with embarrassing consequences at the least, and – at worst – tragic ones.

Two questions:

1) How long has it been since an expert tested your utility's security to see if it is state of the art?

2) If your facility is attacked, are you satisfied – and can you satisfy others who will ask questions afterwards – that you did everything prudent to assure continuing power and protect your personnel?

Burns and Roe has a long history of industrial security experience, both at power plants and for defense contractors. We have a demonstrated capability in the engineering and design of security facilities and systems, including the development of:

- Security planning and procedures;
- Hardened gatehouses, guard towers, vaults and other structures;
- Intrusion detection perimeter systems;
- Controlled access roads and physical structures;
- Application of hardware to access control, detection and alarm systems;
- Management and training of guard forces;
- Guard response procedures.

Designs developed by Burns and Roe represent a defense-in-depth approach with features not generally found in other commercial design facilities. These include:

- Special towers with pan/tilt/zoom cameras for video motion detection;
- Closed-circuit TV cameras in areas identified by sabotage analysis as most logical sites for a combination of an outside threat and help from within;
- Extensive application of multiplexer- and microprocessor-based technologies for signal transmission with automatic self-diagnostic capability;
- Stringent administrative controls in handling documentation associated with security and safeguards design;
- Studies in the design of access control stations using the booth concept of integrating explosive/metal detection and personnel identification via hand geometry;
- Layouts of the plant and arrangement of vital areas to maximize the time required for an intruder to reach vital areas if security is breached;
- VHF radio and telephone links to provide automatic and manual telephone communication;
- Security computer-based electronic systems, keyed into access-control and intrusion-detection systems;
- Redundancy in power distribution to ensure high availability of power supplies
- Intrusion detection system (E Field, microwave, infrared, etc.);
- Security fence designs.

Burns and Roe is prepared to provide a utility with a physical security review which includes:

- Survey of critical facilities by a team of power system and security experts to identify vulnerable points in the office, plant and distribution system;
- Threat analysis to quantify the vulnerability of the facilities and establish whether a terrorist attack could be held off long enough to ensure that help arrives;
- Review of security procedures;
- Confidential report containing observations and recommended action.

The stress of our review is on detection of a threat and minimizing the impact of an attack by layered protection of assets while outside assistance is obtained.

The above survey will be done by Burns and Roe in conjunction with a firm which specializes in security system design Neither Burns and Roe nor the firm provide security system hardware, so that you are assured of an objective analysis of your security needs.

For a detailed brochure on Burns and Roe's safeguards and security services, please call any Burns and Roe office.

New projects

Orange and Rockland Utilities has selected Burns and Roe to provide engineering services in connection with a gas regulating station capacity increase at the utility's Bowline Station.

Nebraska Public Power System has chosen Burns and Roe to provide engineering and construction management services in connection with the decommissioning of the plant process computer and the installation of a new plant monitoring system at Cooper Nuclear Station.

The **Tennessee Valley Authority** has assigned Burns and Roe a number of tasks at TVA's Sequoyah Nuclear Station, including electrical circuit analysis and environmental qualification, as well as work related to the post-accident monitoring system and qualification of components for superheat conditions.

GPU Nuclear Corp. has given Burns and Roe a number of new assignments at the Oyster Creek Nuclear Generating Station, including:

- Engineering and design services, plus field and construction support, for modifications to the emergency diesel generator lube system;
- Engineering and design services involving modifications to the auxiliary boiler house wet pipe sprinkler system;
- Design for modifications to implement NRC rules regarding Anticipated Transients Without Scram;
- Detailed design of a system to provide automatic closure of the containment vent and purge isolation valves.

Toledo Edison has selected Burns and Roe to develop several operational schematic drawings for the Davis-Besse Nuclear Station.

Gene Cattabiani joins Burns and Roe

Eugene J. Cattabiani has joined Burns and Roe as vice president, market planning after a 36-year career with Westinghouse, most recently as executive vice president of power generation.

Mr. Cattabiani will be based at Burns and Roe's world headquarters in Oradell, New Jersey, and will be responsible for strategic planning for the entire Burns and Roe family of companies. He reports to Kenneth A. Roe, chairman and chief executive officer of Burns and Roe Enterprises, the parent corporation.

Eugene J. Cattabiani

Mr. Cattabiani joined Westinghouse in 1950 after receiving a B.S. degree in mechanical engineering from Pratt Institute. He was initially assigned to Westinghouse's Bettis Atomic Power Laboratory where he participated in the design of the Nautilus submarine.

In 1952, Mr. Cattabiani joined Westinghouse's Electro Mechanical Division and was made general manager of the division in 1969. In 1973 he was named vice president and general manager of the Steam Turbine Division and was appointed executive vice president of power generation in 1978.

As long as the "deep pockets" syndrome persists, utilities are vulnerable to catastrophic losses.

Irene M. Moszer

Managing the Insurance Crisis

While business buckles with fear of liability claims, the Energy Insurance Mutual is born.

Risk is nothing new to electric and gas utilities. They deal routinely with regulatory risk, political and environmental risk, the risk of incorrectly predicting future energy patterns, and the physical risks inherent in their day-to-day operations. However, recent conditions in the insurance market worldwide have raised the specter of a new kind of risk—uninsured, catastrophic liability losses.

Utilities typically purchase significant amounts of liability insurance. Liability insurance coverage provides protection from damage claims brought by customers, stockholders, and the general public. Liability risks for utilities could include:

- Decisions made by a board of directors concerning mergers and acquisitions, as well as past decisions about building nuclear power plants.
- General operation of utilities in supplying electricity and gas to the public.
- Handling and disposal of environmental pollutants, such as PCBs and fly ash.
- Operation of coal mines and natural gas wells.
- Dams used in the production of electric power.
- Construction operations.

Insurance is critical to the underpinning of any industrialized economy. It's a risk-sharing system that pools financial resources. The premium payments of the many are available to cover the losses of the few.

But problems in the insurance industry, problems of crisis proportions, are leaving liability insurance either largely unavailable, restricted in the kinds of risks covered, or very expensive. An increasing number of the nation's businesses, its municipalities, and its professional people are facing an unsettling dilemma. They are being forced to make decisions to either cut back on services and reduce the risk of damage claims, or simply operate without insurance and hope that nothing happens.

Responding to this dilemma, representatives from about 70 electric and electric-gas combination utilities met in Chicago in June 1985. As a result of that meeting, 65 utilities and utility holding companies—companies that collectively represent 80 percent of the nation's generating capacity—created and funded a feasibility study to investigate the problem.

The Sedgwick Group of London and its U.S. subsidiary Fred S. James & Company, Inc., of New York acted as risk management and insurance advisors, and Baker & McKenzie of New York provided legal and tax counsel for the study.

In April 1986, the study steering committee voted unanimously to form Energy Insurance Mutual (EIM). The new carrier, based in Barbados, offers both electric and gas utilities protection from infrequent but catastrophic losses in excess of $25 million. EIM's "excess liability" coverage provides a critical supplement to utilities' primary insurance policies, which cover smaller, more routine, and more frequent claims.

The problems giving rise to EIM's organization stem from two basic sources: economic conditions and conditions reflecting a changed application of U.S. civil law.

Riding Insurance Waves

Certainly part of the problem lies with the cyclical nature of the insurance market. At its high point, the cycle is marked by high profitability, high prices, and shortages in insurance capacity. This situation prompts new insurers to enter the commercial insurance market in pursuit of profits.

Greater competition between insurance companies then leads to price cuts as each seeks to maintain or expand market share. Liberal underwriting standards may also result, which lead ultimately to growing losses and shrinking profits. Companies leave the market, and the cycle bottoms out. Coverage is restricted, premiums increase, and the spiral starts up again.

The last period of high profitability peaked in 1978 when property and casualty insurers as a whole realized an underwriting profit of $1.3 billion. The cycle's downturn began in 1979 and continued into 1985, a six-year span twice as long as previous down periods.

During this downturn, interest rates fell, investment income and

---

Dr. Irene M. Moszer is vice president for administrative services with Virginia Power. She served as chairperson for the Energy Insurance Mutual steering committee and has been elected chairperson of the board of directors of EIM.

John Neubauer

profits declined, and claims surged. In 1984, property and casualty insurers had their worst year since the San Francisco earthquake of 1906. Underwriting losses reached $21.5 billion, triggering a net loss for the industry of $3.8 billion. For every $100 of premium collected in 1984, the property and casualty insurance companies paid $118 in expenses and claims.

By the end of 1985, signs of improvement began to appear. A mix of investment income, stock market profits, and tax credits more than offset huge underwriting losses to yield a small net gain of $2 billion. Nevertheless, the insurance industry's 1985 underwriting loss of $24.7 billion was its largest ever. And insurers were still paying about $116 in combined expenses and claims for every $100 of premium received.[1]

This cycle has repeated itself three times over the past 20 years. The current cycle has been relatively the most severe.

Table 1

Energy Insurance Mutual

Comprehensive General Liability Coverage

Includes coverage for:
- Sudden and accidental pollution
- Completed operations
- Failure to supply electricity or gas
- Excess workers' compensation
- Excess auto liability

Claims first-made basis with five-year discovery period

Limits:
- Option to choose coverage starting point of $25 million or higher
- $50 million in excess of starting point for each loss
- $100 million total per policy year

Directors' and Officers' Liability Coverage

Includes coverage for:
- Nuclear operations
- Service on civic or industry-affiliated boards

Claims first-made basis with five-year discovery period

Limits:
- Option to choose coverage starting point of $25 million or higher
- $25 million in excess of starting point for each loss
- $50 million total per policy year

Causes in the Legal System

But not all of the current insurance crisis can be blamed on economic variables. Some of the cause must lie with the changes occurring in the U.S. tort system—our system of determining civil liability under the law.

The most dramatic change within the tort system is unquestionably the shift toward a "no risk, no fault" position for consumers. The buyer of a product no longer assumes risk or responsibility for injuring himself while using it in the customary way; it is now the maker of the product who is liable. In the past, a consumer injured by a lawn mower, for example, had to prove negligence on the manufacturer's part. Today, to recover damages from the manufacturer, the consumer need only prove that the injury occurred while he or she was using the lawn mower in the intended manner.

Other changes in tort law have further increased liability exposure. An example is the growing use of the doctrine of "joint and several liability." What this means is that multiple defendants can be named in a liability suit, and the damage award divided among them according to their ability to pay.

The original application of "joint and several liability" was to cases in which the defendants acted together to cause an injury. In recent years, however, the twist has been to name a defendant with "deep pockets"—the financial resources to compensate an injured party—and force that defendant to pay the entire award, even when minimally responsible. Businesses, cities, insurance companies, and affluent professionals are typical "deep pockets" defendants.

These changes in tort law reflect a shift in attitudes that occurred during the 1960s. Before that time, the tort system had determined liability based on fault. If the party at fault and therefore liable could not pay, the plaintiff could not collect. By the mid-1960s, however, there emerged a strong social priority on compensating the injured. The ultimate result was to weaken the link between fault and liability by transferring the legal burden of compensation from those most at fault to those most able to pay.

Damage awards have soared as a

by Mary Wayne

Hitting an overhead power line with the mast of his catamaran electrocuted a California man as he carried the boat to a trailer at a beach. His family sued Southern California Edison and the maker of the catamaran, winning $515,000 in actual damages. The jury, despite finding that the victim himself was partially responsible for the accident, also awarded $1.4 million in punitive damages against the catamaran company.

Those damages rank as moderate by today's standards. In a recent case in Texas, $64 million was awarded to a worker severely injured when the 15-foot gas well tower he was trying to dismantle fell on him. With awards on this scale for a single plaintiff, the impact of an accident involving multiple workers—or members of the public—could be staggering.

Further, a large company with a high public profile appears to be especially vulnerable to large awards. Juries assume that the company has virtually unlimited resources and sympathize with the plaintiff, the underdog. Following a $37.5 million verdict against the Bank of America that included $19 million in punitive damages, one juror is reported to have remarked, "Everyone could relate to having problems with a bank. . . ."

The vulnerability of large companies to liability claims creates problems even when nothing happens. The fear alone is costly. For example, faced with shrinking availability of directors' liability coverage and an average premium increase of over 400 percent, many service companies are losing the outside members of their governing boards.

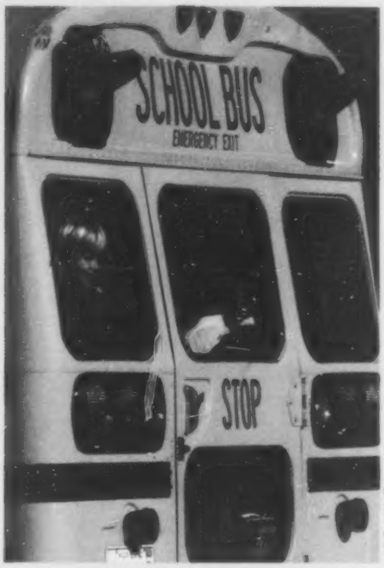
Loss of outside directors can mean loss of valuable business contacts. Institutional investors such as pension or mutual funds may view the exodus as a cue to begin backing away. And banks are casting closer scrutiny on companies with liability insurance problems. The upshot may be reduced lines of credit, increased borrowing costs, or difficulty in getting loans at all. A company's losses can snowball around insurance problems even if it is never actually sued.

Like businesses, cities are highly vulnerable under the doctrine of joint and several liability. The Year of the Tiger almost arrived unheralded in San Francisco last March because the city had no liability coverage for the annual Chinese New Year's Parade. Threatened with cancellation, the parade finally took place after the city paid more than $48,000 for coverage, a sixfold increase over the year before. In 1985, a 550-pound bull headed the column ushering in the Year of the Ox, but this year cautious organizers decided to omit a live tiger from the celebration.

Fear of liability hobbles profes-

Ted Spiegel/Black Star

The Year of the Tiger had no tiger.



Jeff Zaruba/Folio, Inc.

High insurance costs have threatened the provision of basic city services.

sionals as well. A recent survey reports that 23.3 percent of California's obstetricians have stopped or plan to stop delivering babies. Further, the president of the Los Angeles County Medical Association has estimated that nearly one-third of the tests that doctors order are prompted by liability concerns. One out of every 18 U.S. lawyers was sued in 1985. Accountants, architects, and psychotherapists have joined the ranks of professionals targeted for liability suits. Almost no one with the resources to pay a damage award is immune.

Making matters worse is the seemingly arbitrary fashion in which damage awards are meted out. A broken leg may be worth $500 in one instance and $50,000 in another. In the Connecticut case of two sisters suing for whiplash injuries from the same auto crash, the one with a resulting 10 percent disability of the neck received a $73,000 award, while the jury awarded the sister with only 5 percent disability and fewer medical bills the sum of $108,000.

Variation is even greater from state to state, partly because of differences in state liability laws. Juries in southern Florida, for example, have been known for their generosity to plaintiffs. Florida juries rank behind only those of New York and California in handing down million-dollar verdicts.

Overall, the bill for sued companies and insurers came to about $66.5 billion in 1984, or 1.76 percent of the gross national product. Growing awareness that it is the American consumer who eventually pays in the form of higher prices for goods and services has prompted widespread calls for reform. Legislation aimed at changing the legal system, regulating the insurance industry, or both, is pending at the state and federal levels.

Recent voter approval of California's "deep pockets" initiative exemplifies this trend. While payment for actual economic damages is unaffected, the new measure restricts the amount that a "deep pockets" defendant—typically a business or a municipality—must pay for a plaintiff's non-economic claims, such as pain and suffering. If a business is only 15 percent at fault for an accident, it can now be held liable for no more than 15 percent of a pain-and-suffering award.

Hosking/Uniphoto

Some damage awards seem arbitrary, as in the Connecticut whiplash case.

With this measure, California joins several other states that are either abolishing or severely restricting the doctrine of joint and several liability. They include Florida, Washington, New Mexico, Kansas, Ohio, Iowa, Vermont, and New Hampshire. The point of the legal changes is to curb the growth of damage awards and liability insurance premiums. But the effects so far are uncertain.

What does seem certain is that the liability crisis will take time to resolve. Insurance companies may now be regaining their financial health, but past price wars and huge damage awards have left their reserves depleted. Further, a move toward moderation in future awards is by no means assured. Prospects remain dim for a quick turnabout in the cost and availability of liability coverage through traditional insurance carriers.

Mary Wayne is a science writer and communications consultant specializing in the electric utility industry.

Everett C. Johnson/Folio, Inc

Stuart Krasner/Uniphoto

The Energy Insurance Mutual's excess general liability would cover major bodily injury and property damage caused, for example, during the repair of gas equipment or tree trimming near power lines.

general liability coverages, including sudden and accidental pollution, of up to $50 million for any one event. The limit is $100 million for any one policy year. Up to $25 million in directors' and officers' indemnification coverage is offered, with a limit of $50 million for any one policy year. EIM members have the option of choosing the point at which coverage begins, provided that it's not less than $25 million.

The policy is written on a "claims first made" basis. In its most restrictive form, a "claims made" policy covers only those accidents that occur during the policy period and for which a claim is first made during that policy period. In contrast, an "occurrence" policy covers accidents that occur during the policy period even though the claims may not be filed until later. The EIM policy falls in between the strict "claims first made" policy and the "occurrence" policy: EIM coverage provides a five-year discovery period for claims to be made on accidents reported during the policy year.

EIM's funding is provided through a combination of current premiums and capital contributions called reserve premiums.

A member insured's current premium assessment is determined by underwriters based on the operations described in the application. For example, a utility that has a troubled construction program will have greater risks than those that do not, and this will be reflected in the premium. The reserve premium requirement is calculated as a one-time payment equal to the level of a member's current premium when it first joins EIM. If a member, in subsequent periods, brings to EIM additional exposures to be underwritten, additional premium and supplemental Reserve Premiums may be required.

During the start-up period for any new company, insurance or otherwise, financial stability is less certain than when there is a history of growth, with a well-established market and a cost control or loss prevention program.

EIM members make an initial three-year commitment. In other words, they make an investment in the company that, under normal circumstances, will provide for its financial integrity during the early years of operation. As its profitability increases over time, these profits may be used to build EIM's surplus, returned to members as premium credits, or both.

As its surplus grows, EIM will be able to offer higher limits and/or broader coverage to its members. For example, in the future EIM would like to broaden its pollution coverage to include gradual pollution as well as the current coverage for sudden and accidental pollution. If profits are returned, then each member will receive a share in proportion to its contribution to EIM's net worth.

Benefits of a Mutual

EIM offers members the opportunity to pool the utility industry's resources, financial and technical, to build the base for a cost-effective, stable insurance program. Ultimately, the availability and cost of insurance is a function of how well the exposures to risks are understood and underwritten. It's also clearly dependent on how well they can be managed and, therefore, minimized. A mutual form of organization is ideally suited to meet these challenges.

A mutual company is composed of members from a common industry who join together to insure their own risks. The policyholders own and control the mutual for their own benefit. By joining together in a mutual company, the members create insurance capacity to replace the withdrawal of traditional American and European insurers from the marketplace.

There are several advantages to forming a mutual company in the current unsettled insurance markets:

- Better understanding and underwriting of loss exposures.
- Better loss control and safety engineering.
- Lower cost.
- Potential return of underwriting and investment profits.
- Better claim management.
- Creation of a more stable source of insurance.

Risk is best understood by those exposed to it. Since the mutual company is composed of members from a common industry, with common loss exposures, those risks are known intimately and can be underwritten more accurately.

Members' knowledge of their own operations also permits more effective and efficient loss control and safety engineering services to prevent accidents and reduce claims. The members know better than outside parties what types of situations could give rise to claims—and how best to prevent them. Members benefit from this risk management capability perhaps even more than they do from simple risk pooling.

Another advantage of a mutual is its lower operating costs. Since it exists only to provide insurance for its members, it does not have to maintain a large staff and offices dedicated to underwriting other types of insurance for other industries. The mutual relies heavily on volunteer expertise from its members. The emphasis is on a streamlined operation.

Administrative expenses for a mutual generally average less than 5 percent of total current premiums.

A clear reason for the emphasis on cost control is the potential return of underwriting and investment profits for members. In the later years of its existence and in the absence of unexpected losses, a mutual company may return up to 100 percent of a policyholder's annual premium.

With the potential for return of profits to the members, the mutual has an incentive to provide better claim management services. The money being paid out for claims belongs to the members. Those members can be expected to be certain that claims are settled in the least costly manner.

Finally, amid the uncertainty of today's insurance situation, a properly operated mutual assures a stable source of coverage for its members—a source free from the vagaries of the outside, traditional insurance market.

Utility response to the idea of an industry mutual for excess liability protection has been quite positive. EIM began writing policies in July for more than 20 charter members, including holding company systems, covering some 35 electric and gas utilities. It looks like an effective answer to an industry problem. A sound mutual insurance carrier gives the utility industry a chance to manage its way out of the insurance crisis.

Notes

1. Statistics in this and the preceding paragraph are based on Stephen Piontek's article, "Despite Record Underwriting Loss, Industry Netted $2 Billion in 1985," in *National Underwriter*, March 28, 1986, page 1.

2. *Report of the Tort Policy Working Group on the Causes, Extent, and Policy Implications of the Current Crisis in Insurance Availability and Affordability*. U.S. Government Printing Office, Washington, D.C., publication #1986-491-510:40094, February 1986, pages 35-36. Cited from Jury Verdict Research, Inc., *Injury Valuation, Current Trends*, No. 304 (1986). The Tort Policy Working Group was established by the U.S. Attorney General. Its primary contributors were the Department of Justice, Department of Commerce, and Small Business Administration.

3. Lisa S. Howard. "Study Refutes Existence of Lawsuit Explosion," *National Underwriter*, April 25, 1986, page 2. Cited from A.M. Best, a firm specializing in analysis of financial and underwriting statistics on the insurance industry.

4. *Report of the Tort Policy Working Group*, pages 36 and 39. Cited from Jury Verdict Research, Inc., *Injury Valuation, Current Trends*, No. 304 (1986).

5. *Ibid.*, pages 36 and 42. Cited from M. Peterson, *Punitive Damages: Preliminary Empirical Findings*, 13 (1985).

Martin L. Baughman

What Cheap Fuel Will Do to Electricity and the Economy

America will crank out more goods and services and will use more electricity to do it.

What will the recent drop in fuel prices mean to the two-way relationship between economic activity and electricity consumption? It is impossible to know whether the price drop is a short-run phenomenon or a fairly long-term readjustment. If the readjustment persists, then the effects on electricity consumption and on electricity supply will be profound.

According to the 1986 National Research Council report on the role of electricity in economic growth,[1] the drop in fuel prices will stimulate productivity growth in the economy. It will also lead to a real decrease in electricity prices, particularly in those regions of the country where oil is used to generate significant portions of the electricity demand, and elsewhere to the extent that competition from oil holds down other fuel prices. The lower electricity prices will reinforce the direct fuel price effects on productivity growth in the economy. The increase in growth in economic activity will stimulate electricity consumption. The decrease in electricity prices will further stimulate the rate of growth in electricity consumption. Thus, if present fuel prices hold, these trends suggest that growth in electricity use will accelerate in the future. What's more, the change in fuel prices could significantly alter the economic outlook for cogeneration and small power production facilities and conservation and load management compared to conventional electricity supply technologies such as coal, nuclear, oil, and gas-fired steam facilities, combustion turbines, and combined cycle generating units. The economics of these alternatives clearly depend upon the relative costs of the primary factors—capital, labor, materials, and fuel.

The basis for the above analysis starts with the findings of the Committee on Electricity in Economic Growth, which prepared the report for the National Research Council. However, the committee's work was done before the fall in world oil prices and did not specifically address the implications of such an event. When one considers the findings in this context, nonetheless, the committee has a lot to say. Moreover, it did not address the issue of electricity supply. When one adds consideration of the broad implications that the change in fuel prices has on the economics of electricity supply, the outlook for electric utilities is markedly different than it was just a few short months ago.

The Two-Way Relationship

The Committee on Electricity in Economic Growth inquired into the two-way relationship between electricity and economic growth in the United States. There were seven principal conclusions of the study.

First, *electricity use and gross national product have been, and probably will continue to be, strongly correlated.*

This conclusion was drawn from analysis of data for the long historical time period from 1902 to the present. The committee wrote, "In this century, the electricity use/economic activity relationship has been characterized by four well defined periods. Within each period, the relationship has been linear and stable. The first period was prior to World War I and the second from the end of World War I to the end of the 1920s. In the third period, from 1930 through the end of World War II, the linear relationship paralleled that of the 1920s. The fourth period began after World War II and may still be continuing, although the relationship holding after the 1973 Arab oil embargo is still in dispute."[2]

Figure 1 presents a plot of the electricity consumption quantities and gross national product (GNP) for the post-World War II era. Also shown in the figure is a line of regression that best fits the historical data. Two trends are apparent: (1) in overall terms, the straight line fit is a very good fit to the data, and (2) the time period of 1973 to 1984 may represent some departure from the longer historical relationship. After a great deal of inquiry, the committee stated, "We cannot tell whether the relationship after

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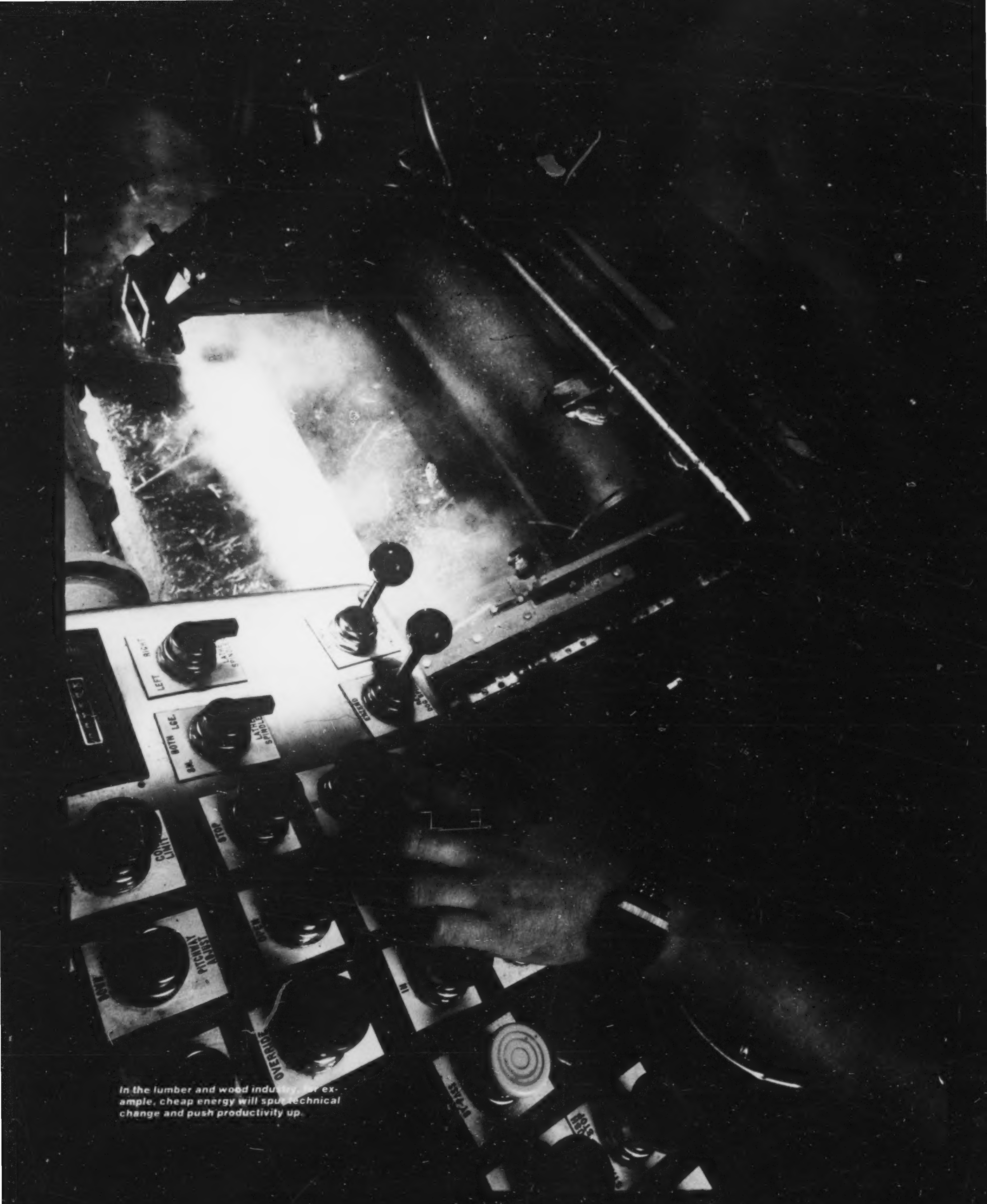
Dale R. Thompson/Folio, Inc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LEFT
LATHE SPINDLE
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STOP
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IN

In the lumber and wood industry, for example, cheap energy will spur technical change and push productivity up.

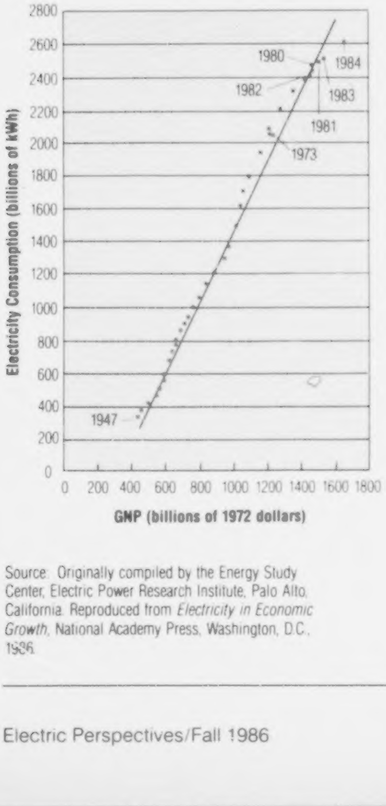
1973 simply reflects variation from the most recent trend line, such as have occurred before, or whether a fundamental change in the relationship is taking place."[3]

Other forces in the relationship between electricity consumption and economic activity were also considered. These included the prices of electricity and competing fuels, the composition of national output, technical change, conservation practices, and government policies. These other forces are useful in explaining the departures from the main trend line in Figure 1. However, the strength of their effects is not so great as to alter the fundamentally strong relationship between electricity use and GNP.

Another linkage between electricity use and economic activity can be traced to the dependence of GNP on productivity growth, which in turn is shown to depend partly on energy prices.

Figure 1

Electricity Consumption vs. GNP in the United States, 1947–1984.



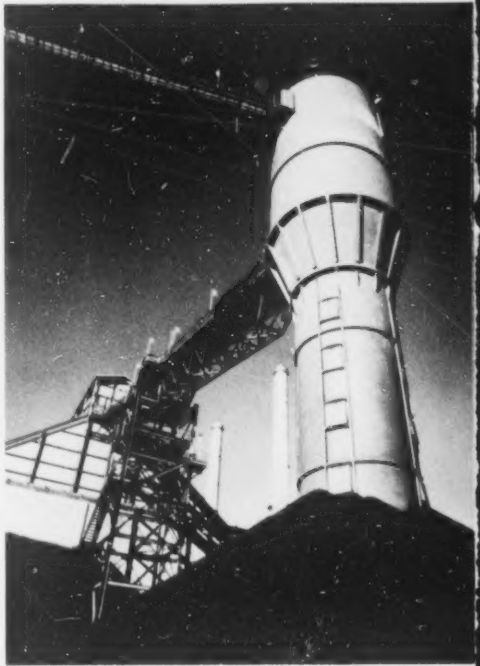
Source: Originally compiled by the Energy Study Center, Electric Power Research Institute, Palo Alto, California. Reproduced from *Electricity in Economic Growth*, National Academy Press, Washington, D.C., 1986.

Lower prices for coal, gas, and oil will increase the competitiveness of conventional electricity supply technologies.

Second, *productivity growth may be ascribed partly to technical change; in many industries, technical change also tends to increase the relative share of electricity in the value of output, and, in these industries, productivity growth is found to be greater the lower the real price of electricity, and vice versa.*

Economic growth, or percentage change in GNP, results from the growth in three factors: capital input, labor input, and productivity. Productivity accounts for increases in output in excess of the contribution of the first two factors. Productivity growth for the economy as a whole derives mainly from sectoral productivity growth and reallocations of value added, capital input, and labor input among the sectors of the economy.

The basis for the conclusion that electricity prices affect productivity growth is a careful analysis of the trends in the use of capital, labor, energy, and material inputs in production in the various economic sectors throughout the post-World War II era. The committee found especially significant the work of Jorgenson in this regard. Jorgenson found, for example, that compared to the earlier time periods, the United States saw a decline in the rate of economic growth in the 1970s. He concluded, "The decline in the rate of U.S. economic growth since the early 1970s is associated with a decline in the sectoral productivity growth rates rather than a reduction in the aggregate growth rate of capital and labor inputs or the reallocation of value added, capital input, or labor input among sectors."[4]



Charles Nishida/Puget Sound Power & Light Company

The sectoral analyses led to categorization of various industries according to their propensities, or biases, in productivity growth. Analyses of a 35-sector breakdown led to a surprising discovery. Fully 23 of the 35 industries possess what is called an electricity using bias and 28 of the 35 possess a nonelectric energy using bias. An electricity using bias in an industry means that if the cost of electricity were to decrease to that industry it would tend to induce technical change in that industry that would improve productivity growth. If electricity costs were to increase in that industry, it would have the opposite effect; i.e., it would reduce productivity growth in that industry. A nonelectric energy using bias has the same meaning, but for nonelectric energy forms. The biases of various industries are listed in Table 1.

The implications are quite significant in that as electrical and nonelectrical energy prices increased in the past, they retarded technical change in the vast majority of industrial sectors and depressed productivity growth. In fact, according to Jorgenson's analysis, the rise in electricity and energy prices during the 1970s reduced productivity growth in our economy as a whole by about 0.8 percentage points.[5] The converse is also true—price decreases of the type recently experienced will lead to increases in productivity growth. Let's return to this point momentarily.

Third, *technical change has made possible many new opportunities for exploiting the special qualities of electricity. In the past, these changes were often associated with increased intensity of electricity use, but in the future their net effect on that intensity will depend on the balance between their increased penetration and the increased efficiency of these applications.*

This conclusion forms the basis for the relationship of productivity growth to electricity prices. According to the committee report, "Once generated, electricity has unique properties that make it an attractive form of energy. These properties include a highly ordered form (including the ability to be focused for efficient use and to produce very high temperatures), flexibility, and cleanliness. There is substantial potential in the major consuming sectors for further applications of electrical energy that take advantage of these special properties. We call such innovations electrification."[6]

This form value of electricity, when taken advantage of, may either increase or decrease the intensity use. The adoption of electrical processing techniques to replace techniques that currently

Table 1

Classification of Industries by Their Patterns of Biases of Productivity Growth

	Pattern of Biases									
	Capital		Labor		Electricity		Nonelectrical Energy		Materials	
Industries	Using	Saving	Using	Saving	Using	Saving	Using	Saving	Using	Saving
Tobacco, textiles, apparel, lumber & wood, printing & publishing, fabricated metal, motor vehicles, transportation	●		●		●		●			●
Electrical machinery	●			●	●		●		●	
Metal mining, services	●		●		●			●		●
Nonmetallic mining, miscellaneous manufacturing, government enterprises	●		●			●	●			●
Construction	●			●	●			●	●	
Coal mining, trade	●		●			●		●		●
Agriculture, crude petroleum & natural gas, petroleum refining	●			●		●	●			●
Electric utilities		●		●	●		●			●
Food, paper		●	●		●		●		●	
Rubber, leather, instruments, gas utilities, finance, insurance, real estate		●	●		●		●			●
Chemicals		●	●			●	●		●	
Transportation equipment & ordnance, communications		●		●	●		●		●	
Stone, clay, glass, machinery		●	●			●	●			●
Primary metals		●	●		●			●		●
Furniture		●		●		●		●	●	

Source: Adapted from D. W. Jorgenson, "The Role of Energy in Productivity Growth," *American Economic Review*, Vol. 74, No. 2, May 1984; and *Electricity in Economic Growth*, National Academy Press, Washington, D.C., 1986, pp. 75-76.

use, or in the past have used, other energy forms tends to increase the intensity of electricity use. The replacement of a blast furnace with an electric arc furnace is an example of this. However, the replacement of a band saw with laser cutting technology is an example where the gain in productivity more than offsets the higher electricity use, leading to a reduction in overall electricity intensity of use. Table 2 presents a more complete array of industrial electrotechnologies and their applications.

Fourth, *electricity prices and alternative fuel prices affect electricity consumption in two ways: (1) they directly affect the use of electricity and nonelectric fuels as input factors of production; (2) they indirectly affect productivity growth and thereby economic growth.*

The direct effect of the prices of electricity and nonelectric fuels on electricity consumption is readily accepted as a result of basic economic reasoning. When electricity prices increase, electricity consumption tends to decrease, and vice versa, all other things being equal. When alternative fuel prices change, electricity consumption changes in the same direction of the alternative fuel price change.

The changes in electricity and nonelectric fuel prices over the years have been very dramatic. Figure 2 presents this data for the period 1935 through 1984. Note, however, that despite the changes indicated for the period 1947 through 1984, the relationship between electricity use and GNP indicated in Figure 1 has held. The persistence of the essentially linear relationship during a time of significant price excursions indicates that something more fundamental is going on. That something more fundamental is the second and indirect way that electricity and nonelectric fuel prices affect electricity consumption.

That second way is the way these commodities prices affect economic growth through the process of technical change described above. The resultant technical change shows up in changes in productivity growth. The resultant economic growth in turn shows up in changed electricity consumption. Through this "feedback loop" of energy prices to economic activity to electricity consumption

Table 2

Industrial Electrotechnologies and Their Applications

Technology	Major Applications
Arc furnace steelmaking	Wide range of steelmaking processes
Plasma-based metals reduction	Extractive metallurgy and ferrous metals processing
Plasma-arc production of chemicals	Production of acetylene and ethylene, use of coal to produce basic chemicals, etc.
High-temperature electrolytic reduction	Improving productivity in producing aluminum and magnesium
Induction melting	Improving productivity in many varied applications in metals production
Plasma melting, cutting, and spraying	Large-scale melting of basic metals
Induction heating	Forging industry and potential large-scale applications
Electroslag remelting and casting	Production of high-alloy ingots of simple geometry and potentially those of complex geometry
Laser materials processing	Metal cutting, drilling, welding, and heat treating
Electron beam heating	Welding and heat treating in automotive, shipbuilding, and related industries
Other high-temperature technologies (resistance melting, resistance heating, vacuum melting, homopolar pulsed heating, etc.)	Materials production and fabrication
Heat pumps and mechanical vapor recompression	High-temperature heat recovery (e.g., in pulp and paper industries), distillation, and drying
Electrolytic separation and electrochemical synthesis	Production of inorganic chemicals, water treatment, trace metal removal, etc.
Dielectric heating with microwaves and high-frequency radiation	Food processing and drying applications
Ultraviolet and electron beam radiation curing	Improving productivity in the coatings industries
Other medium- and low-temperature technologies	Surface coatings, various industrial operations, uranium separation, etc.

comes the close relationship between electricity consumption and GNP.

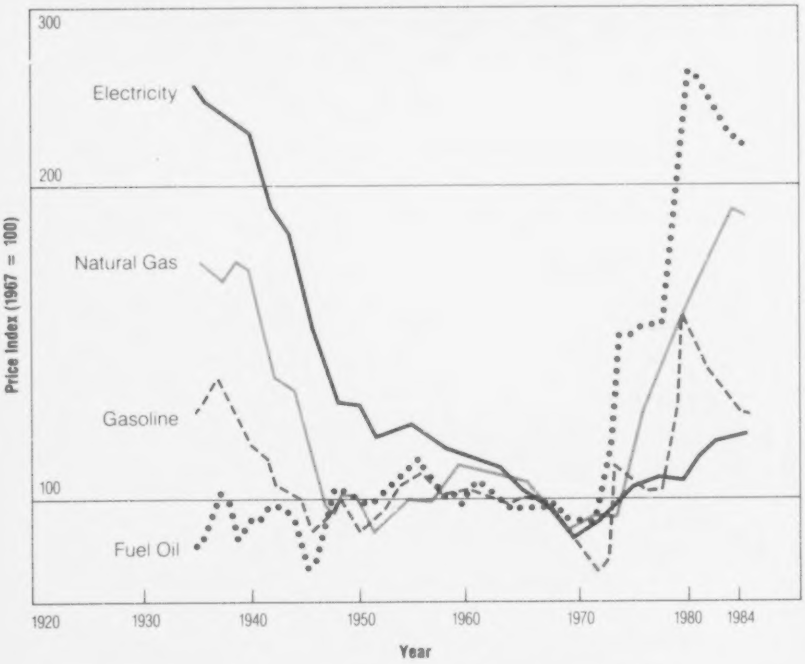
Fifth, *there is further potential for increasing the efficiency of electricity use, particularly in the residential and commercial sectors.*

This conclusion stems from inquiry into the technical opportunities that are available for increasing the efficiency of electricity use. Of particular interest are potential improvements in building envelopes and lighting systems in both the retrofit and new building markets. However, there are also significant uses of electricity in these sectors that may result in increases in electricity consumption. Air conditioning and electric space heating are two end uses that hold significant potential for growth.

The committee's report points out that "energy prices have been the main incentive for investing in conservation. The main constraints to such investment have been immaturity of the technologies, lack of information, lack of capitalization funds, inefficient electricity and fuel pricing, and doubts about the cost-effectiveness of such investment. . . . The effects of residential conservation investments do not show up directly in sectoral productivity measures. However, their macroeconomic effect may be evidenced in a change in the composition of sectoral output and in changes in consumption from the income effect of reduced energy costs. In the commercial and industrial sectors those conservation measures that are cost effective would appear in measures of sectoral productivity growth."[7]

Figure 2

Trends in Real Energy Prices to U.S. Personal Consumers, 1935–1984



Source: Reproduced from *Electricity in Economic Growth*, National Academy Press, Washington, D.C., 1986

Sixth, *changes in the composition of national output toward less electricity-intensive goods and services have been offset by growth in the intensity of electricity use within all the major use sectors so that the combined effect on electricity demand growth has not yet been great. However, if the trend toward a leveling off in sectoral electricity intensity growth that began in the late 1970s continues, future shifts toward less electricity-intensive goods and services are likely to dampen electricity demand growth relative to national output.*

The electricity intensity of the industrial sector is about three times that of the commercial sector. As a result, all other things being equal, as the composition of output of the economy moves to a service orientation it reduces electricity use. However, there were large increases in average electricity intensity in all three major consuming sectors—residential, commercial, and industrial—after World War II that more than counteracted the effects of changing composition of output. Recently, since 1973, the trend in growing average intensity of electricity use has abated in all three major sectors of consumption. The committee wrote, "It is uncertain whether recent declines in sectoral electricity intensity growth represent the beginning of a new long-term trend or a response to short-term influences."[8]

Seventh, *valid conclusions about electricity demand drawn from national data do not necessarily pertain to regional circumstances; there are significant regional differences in such factors as economic output, prices, electricity supply mix, availability of generating* *capacity, climate, and regulatory environment.*

The analyses and reporting of the above findings were done before the collapse of oil prices early this year. Nonetheless, the analyses cover a time period in which significant and dramatic price changes for electricity and alternative fuels were experienced. When one works the implications of the recent fuel price changes through the conclusions, it portends a much different outlook for electricity demand than was forecasted just a few short months ago.

The Effect of the Fuel Price Drop

At this stage, there is no way of knowing whether the price conditions of the last several months will persist over the long term or whether the price conditions that exist now are a short-term disruption in the energy markets. There is data that can be used to argue that the availability of energy is sufficient in the short to intermediate term to forestall any future price increases. However, much of the world's oil supply comes from a relatively unstable part of the world, making it impossible to rule out political events that could significantly change the supply and demand balance with virtually no warning. But, if one hypothesizes that current prices for fossil fuels hold steady for the next several years, then what will be the effects on electricity demand?

For the time period 1980 through 1984, payments for fuel represented nearly half of the costs of producing electricity in the United States.[9] The percentage of electricity generated from oil and natural gas varies by geographic region of the country. New York, New England, Florida, the Southwest Power Pool, Texas, and the California-Southern Nevada regions of the country are more dependent than the average on oil and natural gas for electricity generation. One would expect, as a result, that electricity prices in these regions would benefit more with the reductions in fuels prices, stimulating the productivity growth increases referred to above as well as directly influencing consumer decisions on electricity purchases.

Consider the magnitude of the effects of the fuel and electricity price changes on productivity growth. The committee reported a significant linkage between productivity growth and energy prices. Following the oil price increases in 1973 and the energy price increases generally of the period, productivity growth fell about 0.8 percentage points per year below the historical trend. When one considers the recent historical relationship between electricity consumption and GNP illustrated in Figure 1, it translates into a decrease in electricity consumption growth of 0.8 percentage points per year. This is quite significant indeed when one considers that the growth in electricity consumption averaged only about 2.0 percentage points per year over the period 1973 to 1983 on a national average.

In response to the recent price decreases, if they prevail, we can expect a stimulus to productivity growth of like magnitude. This will come about as a result of the so-called biases of technical change considered in the third conclusion of the report. Twenty-eight of the 35 industries in Figure 3 were nonelectrical energy using industries, meaning that decreases in the real costs of nonelectric fuels in these industries will induce technical change that leads to productivity growth, and, in 23 of the 35 industries, the real electricity price decreases will induce technical change that leads to further productivity growth.

The mechanisms by which the productivity improvements might come about are many and varied. The report subclassifies the technical opportunities for improving productivity through use of electricity as:

- those changes in which processes using electricity as the primary energy form displace traditional processes that depend on fossil fuel heat, mechanical energy distribution, or human labor. Generally, such processes lead to an increase in electricity use. The example of steelmaking with an electric arc furnace as a substitute for the basic oxygen blast furnace is highlighted in the report as illustrative of this kind of technical change.

- those changes in which electrotechnologies displace older electrotechnologies and provide more efficient matching of energy availability to need, resulting in less energy consumption per unit of output and often a rise in productivity with respect to other inputs as well. Such technologies may or may not lead to increased electricity use compared to the technology being replaced. What the new alternatives usually do offer, however, is one or more of the following gains: high energy efficiency, less product waste, better precision and control, higher speed, less environmental impact, reduced labor and maintenance requirements, better reliability and quality assurance, and overall economic advantages. An example of this kind of technical change includes metals processing by lasers and electron beams.

- those changes in which additional capital investment in equipment and structures displaces some operating energy requirements. Many conservation techniques represent this kind of technical change.
- those changes in which enhanced productivity and quality of output that depend on electricity are qualitatively clear but are not yet easily classified by the direction of energy displacement, such as many computer applications in manufacturing and offices.[10]

As the committee pointed out, the four opportunity categories above do not nearly cover the wide range of electrical applications of new technologies, nor are they necessarily the most important. They do, however, provide insights into the way technical changes in using electricity may increase productivity growth and change energy consumption. Here are examples of each of these categories:

Arc Furnace Steelmaking

Arc furnace steelmaking substitutes an electricity-dependent technology for one that traditionally used another energy form. At the same time, the change of technology offers extensive changes in other aspects of the production process.

The production of molten steel from scrap in an electric arc furnace is the primary competitor to the conventional blast furnace-basic oxygen furnace. Figure 3 illustrates the two alternatives. In the conventional blast furnace, the iron ore is introduced into the furnace with limestone and coke. The molten iron is then further processed with oxygen or other additives to produce molten steel. In the electric arc furnace, the steel scrap is melted directly with a high-intensity arc. The composition of the steel product is controlled primarily by varying the composition of the charge. Although virtually all steel produced today with the electric arc furnace comes from scrap steel, it is possible to use direct reduced iron generated from ore as an input to the steelmaking process. The electric furnace requires about one-third the primary energy of the blast furnace-basic oxygen furnace.

There are a number of other features of the electric technology that

The Cleveland Electric Illuminating Company

For the steel industry, arc furnaces—more cost-efficient and flexible than basic oxygen blast furnaces—capitalize on electricity's "form value."

were reported to have motivated its adoption:

> Capital costs of blast furnace mills are typically about $450 per annual ton of capacity, compared with about $100 per annual ton of capacity for an electric furnace mill. Furthermore, integrated mills must be sized to take advantage of optimal economy of scale because of the requirements of large ore-handling, cokemaking, and pollution abatement facilities. The economic viability of small electric 'mini-mills' close to particular markets has introduced decentralization to the steel industry. . . . The flexibility in output batch size, feedstock, and product specifications yields better deliverability, and therefore better coupling to market needs, resulting in better market penetration. . . . The ability of mini-mills to produce customized output on relatively short schedules provides a market advantage in many applications.[11]

Thus, the electric alternative offers not only a change in energy form used but also lower cost, added flexibility, and possible decentralization of plant locations.

Metals Processing by Lasers and Electron Beams

Processing metals with lasers and electron beams represents the substitution of a newer electrotechnology for an older one. These new techniques represent remarkable advances in a number of metals processing and fabrication applications including cutting, welding, drilling, and heat treating. The controllability and intensity of the heat source makes the newer techniques generally more energy efficient than the older processing techniques, but their principal advantages are speed and labor savings.

An attractive application of lasers is the cutting of precision components. The high energy deposition rates of lasers and their ability to control the energy source precisely in location, direction, time, and intensity produce tre-

Lasers can make precision cuts 10 to 20 times faster than saws.

Mason Morfit/Eastern Utilities Associates mendous productivity advantages. Cutting speeds of lasers can be 10 to 20 times faster than conventional saws for a variety of titanium and steel materials.

The primary application of electron beams is the welding of thick steel and aluminum sections, as used in the automotive and shipbuilding industries. The intensity and focusability of the electron beam welders provide numerous productivity and quality improvements compared to conventional welders. Conventional welders often require several passes to complete a weld of one-inch-thick steel or titanium, whereas plates ranging from ½ inch to 6 inches thick can be welded in a single pass with an electron beam welder. In addition, electron beam welding results in a much smaller heat affected zone around the weld, yielding higher weld integrity and less shrinkage that needs to be corrected by postprocessing heat treatments.

Investments in Energy Efficiency in Buildings

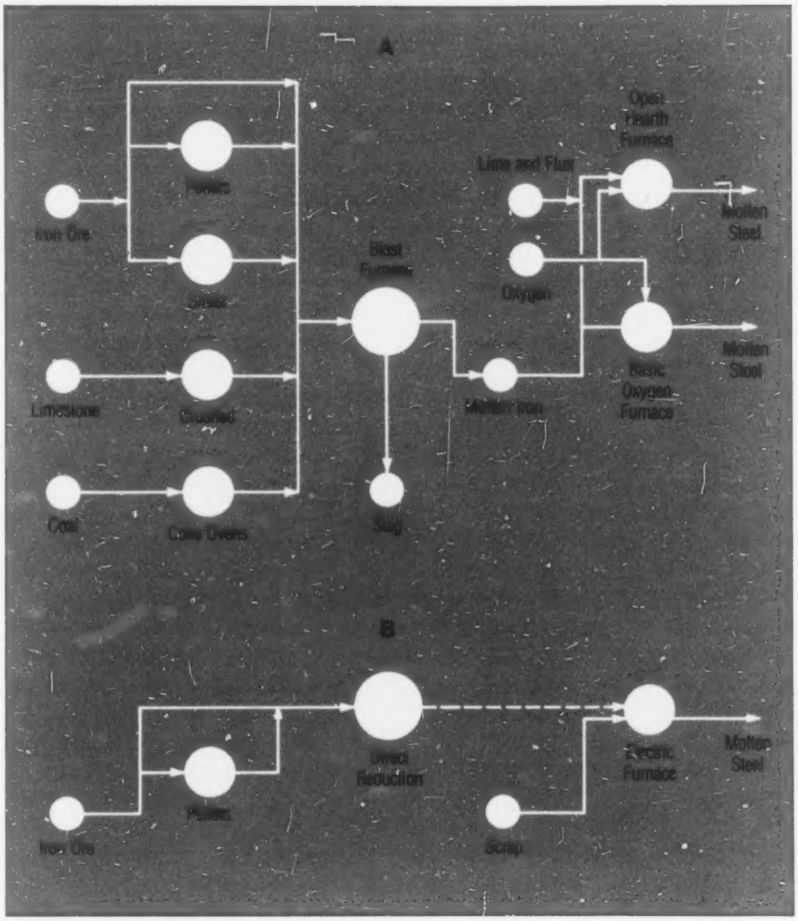
There are a number of opportunities for improving the energy efficiency in buildings for such end uses as heating, ventilation, air conditioning, and lighting. However, these improvements usually also require additional capital investment compared to the existing or traditional methods of providing these building services. What is also interesting about this category of productivity enhancement is that most opportunities are already well known, with readily available technologies, such as:

- using insulation, double glazing, and tinted and reflected glazings;
- using heat pumps and other more efficient heating, ventilation, and air conditioning equipment;
- using advanced lighting technologies;
- using energy storage systems to reduce peak load;
- improving controls for more efficient energy management; and
- improving building design.

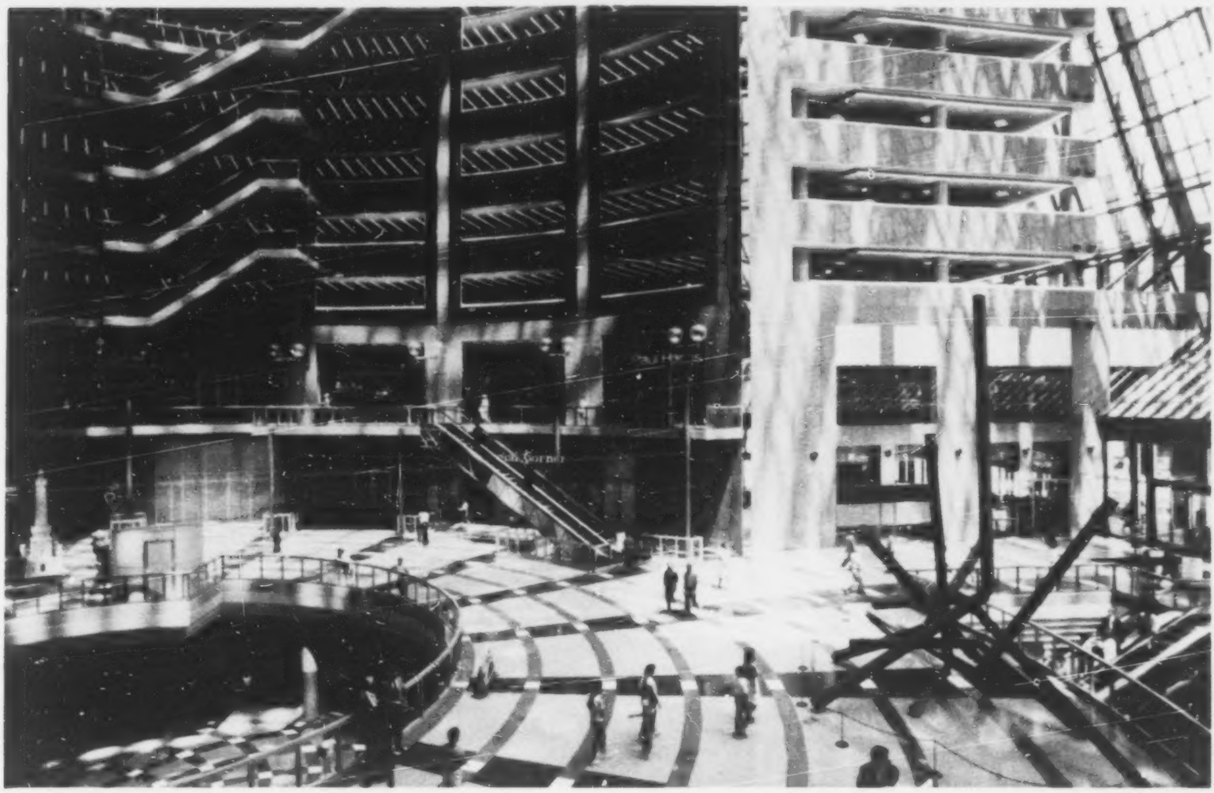
Some of these features can be retrofitted, but with less effect on energy use than if they are designed into a new building. Application of these techniques to new construction can reduce energy use per square foot of floor space as much as 50 percent or more of an average building's energy use. Unfortunately, it is not easy to predict to

Figure 3

Comparison of Steelmaking Processes: (a) Integrated Blast Furnace, (b) Electric Arc Furnace



Source: Originally in P. S. Schmidt, *Electricity and Industrial Productivity—A Technical and Economic Perspective*, Pergamon Press, Elmsford, New York, 1984. Reproduced from *Electricity in Economic Growth*, National Academy Press, Washington, D.C., 1986.



Peter Beck/Uniphoto

Investing in new buildings designed for energy efficiency can also boost productivity.

what extent new buildings will approach their energy efficiency potentials, especially now that energy prices have abated.

Computer Automation

Computer automation is yet another area of increased productivity through technical change. Included here are such advances as robotics, computer-aided technical analyses, communications systems, miniaturization of office equipment, and faster and larger electronic data storage. The full range of applications of computers cannot be foreseen, nor is it possible to foretell the extent of the effects on growth and development of new products and services. Nonetheless, the computer revolution is upon us, and computerization is affecting every aspect of modern life.

Curiously, however, while we know computer technology has a net benefit on productivity, especially in the context of information storage and transfer, we do not know its ultimate impact on energy use. Applications of computers have a direct bearing on the efficiency with which time, space, capital, labor, energy, and materials get used, but we do not yet know whether the automation itself is electricity using or electricity saving.

The Competitive Edge

This review of examples is short. It does serve, however, to illustrate the basic point that electricity offers special features that can play a major role in productivity growth.

At a national level, the most recent projected growth of electricity demand has fallen to a 2.3 percent per year compound growth rate for the next ten years.[12] It took many years for the industry to lower its demand growth expectations down to this value. As the growth expectations have lowered, so have the planned installations of new utility-owned generating capacity. Over this same ten-year projection period, installed generating capability is projected to grow at 1.65 percent per year.[13]

Before the recent price drop, there were indications that the outlook for electricity demand growth was permanently reduced in response to the higher fuel prices of the 1970s and early 1980s, and that alternatives to conventional electricity supply, such as conservation and load management, cogeneration, and small power production facilities would take a larger and larger proportion of the electricity supply picture. The recent change in fuel prices, however, in addition to changing the demand outlook for the reasons noted above, has changed the economics of electricity supply.

The principal economic advantage of the alternatives to conventional electricity generating technologies is their fuel efficiency. Since the reduction in fuel prices, the competitive advantage of these alternatives has eroded. This does not mean universally that these alternatives are no longer economically viable; there are likely many applications of these alternatives that are still economical when compared to conventional technologies. What it does mean is that the output of these alternative electricity supply technologies must compete with a lower cost product, and opportunities that were marginally economical at previous fuel and electricity prices will cease to be economically viable at the new lower values.

The committee did not analyze the economics of alternative electricity supply technologies. Nor did the committee address the question of how much supply capability should be made available in the future to serve future electricity demands. In light of recent events, however, it appears that the demand growth for electricity will accelerate and that the alternatives to conventional electricity supply have lost some of their competitive edge. ⚡

Notes

1. *Electricity in Economic Growth*, A Report Prepared by the Committee on Electricity in Economic Growth, Energy Engineering Board, Commission on Engineering and Technical Systems, National Research Council, National Academy Press, Washington, D.C., 1986.

2. *Ibid.*, p. 7.

3. *Ibid.*, p. 7.

4. Jorgenson, D. W., "The Role of Energy in Productivity Growth," *American Economic Review*, Vol. 74, No. 2, 1984, pp. 26-30.

5. *Electricity in Economic Growth*, Table 3-1, p. 65.

6. *Ibid.*, p. 9.

7. *Ibid.*, p. 11.

8. *Ibid.*, p. 12.

9. Calculated from the ratio of expenditures for fossil fuel to total revenues for the investor-owned electric utilities. The data is from Edison Electric Institute, "Statistical Yearbook of the Electric Utility Industry," Washington, D.C., various issues.

10. *Electricity in Economic Growth*, pp. 90-91.

11. *Ibid.*, pp. 92-93.

12. *1985 Electric Power Supply and Demand*, North American Electric Reliability Council, Research Park-Terhune Road, Princeton, New Jersey, 1985.

13. *Ibid.*

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Gene Pokorny and James Murphy

How to Earn Customer Satisfaction

Find out what they want and make sure they get it.

Satisfying customers in today's increasingly competitive energy market is no longer simple. In the old days, electric utility companies met their residential customers' needs and expectations by merely bringing electricity to them.

Now meeting customer needs is a more complex matter. While they still see the electric company as a product institution, with many taking the product for granted, they also see the company increasingly as a service institution. And customer service today means much more than it used to. Now companies must prove to customers that they care and are concerned about them and their problems, that they value their business, and that they respect them as people.

In fact, the ultimate judgments customers make about the company and the prices it charges depend equally on how they evaluate its delivery of customer service and the product itself. To earn customer satisfaction today and build the customer loyalties needed to beat the competition, electric companies must devote greater effort to meeting customer needs, wants, and preferences in the customer service or concern and caring area.

The Residential Customer Program Segmentation Study, completed in mid-1986 by Cambridge Reports for Edison Electric Institute, uncovered what types of electric company programs and activities can best demonstrate a company-wide commitment to service. In addition, we specifically identified which customer segments want and respond best to different kinds of program offerings. From all the data insights emerged that show how electric companies can become superior service delivery organizations.

What We Discovered

One thousand conversations with individual residential customers in their homes throughout the country were conducted for the Residential Customer Program Segmentation Study. This national consumer opinion survey was designed to represent the adult American population. The interviews were done from November 2 to December 15, 1985.

When the data collected in the survey was analyzed, four things became clear.

First, residential customers think about their electric company's overall service performance in a relatively small and manageable number of ways. When we asked respondents to rate the importance to them of 33 specific electric company programs that could prove a sincere commitment to customer needs, we found through the statistical techniques of factor analysis that customers think about all these programs along seven key underlying dimensions.

Second, customers not only rate reliability of service and emergency repair efforts as the most important programs of all, but they also rate quite highly their company's present performance in these two areas. While these results are not unexpected, it is crucial to note that efforts to ensure reliability of service and emergency repairs can be seen by customers as company demonstrations of concern and caring, not merely as attributes of electricity, which is often the way electric company personnel view them. This distinction is subtle but important, for it means electric companies should themselves think and talk, both internally and externally, about their commitment to the traditional "reliability of service" concept as a commitment to concern and caring for customers rather than to a level of product quality. In the language of marketing and advertising professionals, "reliability of service" programs and activities should be thought of and presented as consumer benefits, not product attributes.

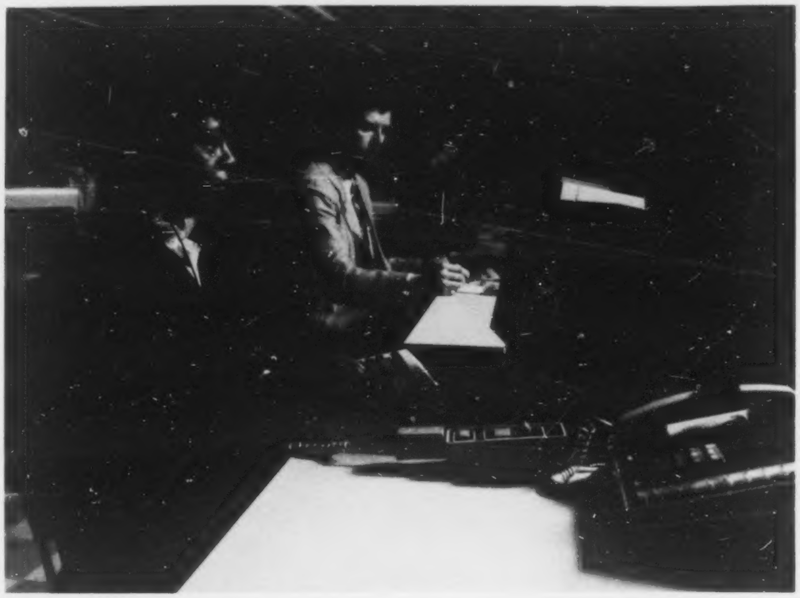
Third, customers want more personal control, with efficacy, over the size of their monthly electric bills; programs that help customers get that desired control are rated as critical and exceptional demonstrations on the part of the electric company that it is concerned about the well-being of the public.

In customers' eyes, cost-control programs are divided into three types: bill payment programs that help customers better manage paying the electric bills they are now incurring, low involvement cost-control programs, and high involvement cost-control programs. The latter two types of activities help customers actually decrease the size of their future bills.

Gene Pokorny and James Murphy are principals of Cambridge Reports, Inc., in Cambridge, Massachusetts.

The Cleveland Electric Illuminating Company

The right mix of services for the right customers will prove that you really care.



The Cleveland Electric Illuminating Company

Certain types of residential customers find bill payment programs very helpful.

The distinction customers make between low involvement offerings (cash rebates for buying energy-efficient appliances and time-of-day rates, for example) and high-involvement offerings (automatic air conditioner cycling, appliance interlock devices, etc.) seems to be based on their perceptions of whether the cost control measure is easy-to-do or hard-to-do and on whether they or their electric company is exercising the "control."

Fourth, other kinds of electric company programs and activities should be targeted to segments of the customer base. For example, efforts that involve customers in company decisionmaking, public informational and educational programs, and community betterment activities on the utility's part are all seen by various differing segments as superior demonstrations of an overall company commitment to service.

The central message of the Residential Customer Program Segmentation Study is the critical importance of careful segmentation of residential customers according to service preferences. Different groups of customers want and need different things. While some of the concern and caring programs and activities that we examined clearly scored better than others nationally, all of them have significant effects on the extent to which various customers see the electric company as a customer-driven organization.

How They Think About Customer Service

Let's look a little further.

To fully examine how residential customers think about and evaluate whether their electric company is truly customer-centered and committed to serving them, we asked all the respondents in our national survey three sets of questions. While all the questions focused on the theme of customer service, each of the three sets was constructed in a specific way so its data could be analyzed by a particular statistical technique.

Seven Underlying Dimensions

In the first set of questions, we asked respondents to rate the importance of 33 kinds of programs and activities that an electric company could offer. After analyzing these ratings, we discovered that most of them are strongly correlated with one of seven underlying dimensions.

These dimensions are:

1. Service reliability and customer relations activities,
2. Educational programs,
3. Bill payment programs,
4. Low involvement cost-control options (company-offered financial incentives for conservation and energy efficiency),
5. Company-provided consumer information,
6. High involvement cost-control options (company-offered demand-side management programs), and
7. Community betterment programs.

Table 1 presents some key programs that make up these dimensions.

It is interesting to see that emergency service and 100 percent service reliability cluster together with company service representatives, crime watch programs, and information about rates to form a common dimension or factor that we call service reliability and customer relations activities.

Customers apparently see the "reliability of service" attributes of an electric company as well as its efforts to explain rates and bills and handle complaints as interrelated in a kind of broad, more traditional concept of service. A company's crime watch activities may be part of this dimension in the minds of customers because these activities are carried out by the same employees—repair personnel and linemen—who are the symbols of reliable service and emergency work.

On each of the seven dimensions, we divided residential customers

Promises made.

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We're number one. More precisely, the $450 million worth of systems we've installed in the last 18 months in the U.S. makes us the leading supplier of transmission systems to the U.S. electric utility industry.

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Here are some of our recent success stories. Give us a chance and your next transmission installation will be among them. That's a promise.

Static Var—We've completed three thyristor-controlled static var projects for electric utilities in the U.S. (Kansas Gas and Electric) and Canada (Hydro-Quebec) over the past 3½ years. Their total capacity, 2,355 Mvar, represents almost 80% of the market and four times that of our nearest competitor.

Series Compensation—We come out on top here, too. The totals: four projects (two each for Pacific Gas and Electric and San Diego Gas and Electric) representing 2,293 Mvar over the last 3½ years.

GIS—We're responsible for nearly 30% of all the GIS installations in North America 500 kV and above over the past 3½ years, and almost 40% of all GIS breakers 115 kV and above for the U.S. utility industry. Our customers: Southern California Edison and Pennsylvania Power and Light.

HVDC—You'd expect us to lead the pack, and our success lives up to your expectations. The three HVDC projects we've completed in the last 18 months (between Vermont Electric Power Company and Hydro-Quebec; Bonneville Power Administration and Los Angeles Department of Water and Power; and Intermountain Power Agency and LADWP) total 2,200 Mw, almost twice as much as our nearest three (yes, three) competitors combined.

$450 million worth of promises kept.

Here's a project-by-project description of how we went from nowhere to number one in the U.S. transmission system business in the last few years.

CUSTOMER	PROJECT NAME/SIZE	KEY POINTS
Static Var Systems Kansas Gas & Electric Company	Murray Gill Substation —25 to +200 Mvar (138 kV) Gordon Evans Substation 0 to +300 Mvar (138 kV)	–Turnkey project –Includes technology proven at AEP Beaver Creek
Hydro-Quebec	Chibougamau, Quebec 2 x (—115 to +330 Mvar) (735 kV)	–Turnkey project
Hydro-Quebec	La Verendrye, Quebec 2 x (—115 to +330 Mvar) (735 kV)	–Turnkey project
Series Compensation Systems Pacific Gas & Electric	Tesla Substation 600 Mvar (500 kV) Table Mountain Substation 600 Mvar (500 kV)	–Short delivery requirements –Largest zinc oxide protected systems in world –Advanced seismic design
San Diego Gas & Electric	Imperial Valley Substation 2 x 150 Mvar (500 kV)	–Advanced seismic and electrical design
HVDC Systems Los Angeles Department of Water & Power (LADWP) Intermountain Power Agency	Intermountain Power Project 1600 MW ± 500 kV 496 miles	–Built to equal nuclear plant standards –Turnkey project
Bonneville Power Admin LADWP	Pacific Intertie Upgrade 2000 MW ± 500 kV 846 miles	–Accepted 2 weeks ahead of schedule –New generation control technology
Vermont Electric Power Company Hydro-Quebec	Highgate 200 MW ± 56 kV Back-to-back	–Turnkey project –World's fastest completion: 17 months
GIS Systems Southern California Edison	Serrano Substation 500/230 kV	–Advanced seismic design
Southern California Edison	Valley Substation 500/115 kV	–Turnkey project
Pennsylvania Power & Light	Sunbury Substation 550 kV Wescosville Substation 550 kV	–First 500kV GIS stations in U.S. by European supplier

To find out more about our systems and our promises, contact Dave Brucker, ASEA Power Systems, 66 Bovet Road, San Mateo, CA 94402. (415) 574-5400.

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Table 1

Programs Behind the Seven Underlying Dimensions
Service reliability and customer relations activities
Commitment to keeping service reliability near 100 percent
Twenty-four-hour emergency service
Customer service representatives to answer questions about bills
Company information explaining rate charges
Company-sponsored crime watch programs
Educational programs
Programs to teach children home energy conservation
Programs to teach children to use electricity safely
Bill payment programs
Credit counseling to help customers pay their bills
Average payment programs
Low involvement cost-control options
Cash rebates to customers for buying energy-efficient appliances
Low-interest/no-interest home energy loans
Time-of-day rates
Company-provided consumer information
Free information on suitable electric equipment and appliances
Information on electricity usage of different appliances
Consumer advisory panels that represent customer views to company
Company representatives who talk to community groups
High involvement cost-control options
Programs charging lower rates in return for allowing utility to turn off water heater or air conditioner at certain times
Installing appliance interlock devices
Community betterment programs
Company donations to community youth activities and charities
Energy-efficient model homes to demonstrate best ways of saving electricity
Company/customer contributions that help low-income people pay electric bills
Buying goods and services from local businesses to promote economic growth
Programs to maintain recreational areas around power plants

into groups or segments according to their responses in the low, moderate, and high ranges. Table 2 presents these segments on each dimension. It is worth noting that all seven of these program and activity types are considered at least moderately important by overwhelming majorities of people.

Demographically, Americans see things quite differently. Service reliability and customer relations activities scored as moderately or highly important with nearly all demographic groups. But women, customers aged 18 to 25, young married couples with children, and those with less than a high school education are more likely than are men, better-educated customers, and older respondents to fall into the high importance category.

Educational programs appeal most to women, people with monthly electricity bills of $126 or more, young families, and younger respondents.

With bill payment programs, we find that women and black customers, more so than men or white customers, like this kind of help. Older people and people with higher levels of education and income are less interested, but younger people and those who have less education and income are more interested, as are young singles and young married couples with children.

On low involvement cost-control options, customers aged 18 to 35, high school graduates, black customers, and those who are divorced or separated are more likely than customers generally to feel company-offered financial incentives for conservation or energy efficiency measures are very important. Young married couples with children are more likely and empty-nest households are less likely to agree. High involvement

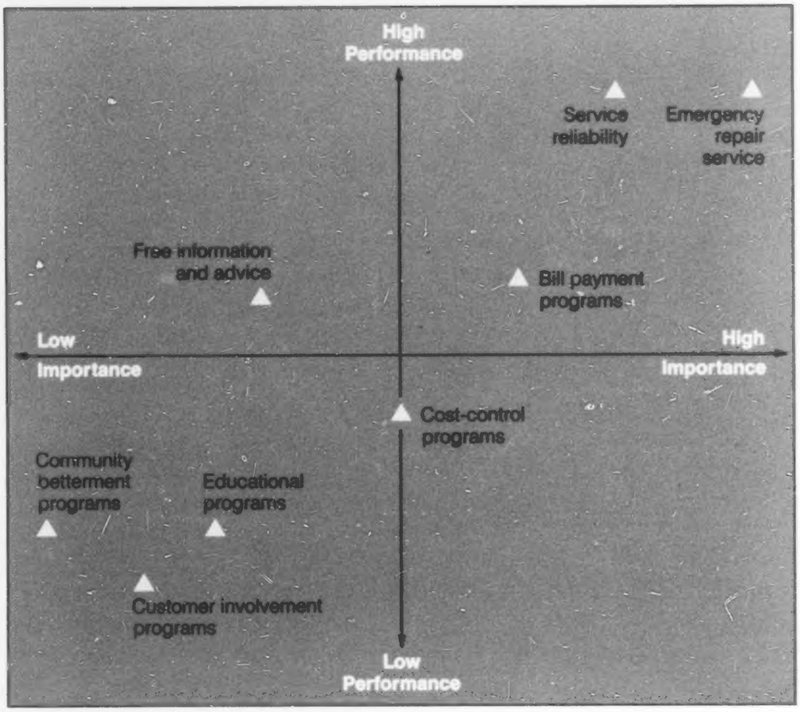
Table 2

Customer Segments Based on Importance Ratings of the Seven Underlying Program Dimensions

	Customer segments		
	Low importance	Moderate importance	High importance
Service reliability and customer relations activities	1%	45%	54%
Educational programs	11%	44%	45%
Bill payment programs	11%	51%	39%
Low involvement cost-control options	9%	63%	28%
Company-provided consumer information	8%	69%	23%
High involvement cost-control options	35%	50%	15%
Community betterment programs	19%	68%	13%

Table 3

Importance and Performance Ratings of Eight Categories of Programs



cost-control programs are of high importance to a slightly different mix—people aged 18 to 25 and 36 to 55, those with some college education, young parents, renters, and black respondents.

When we next look at company-provided consumer information, we find that younger, lower-income, and less-educated customers are more likely than their older and upscale counterparts to want this type of service. People with higher monthly electric bills ($126 or more) are significantly more likely than customers with lower bills to feel these programs are very important. Divorced or separated people and young married couples also highly favor these programs.

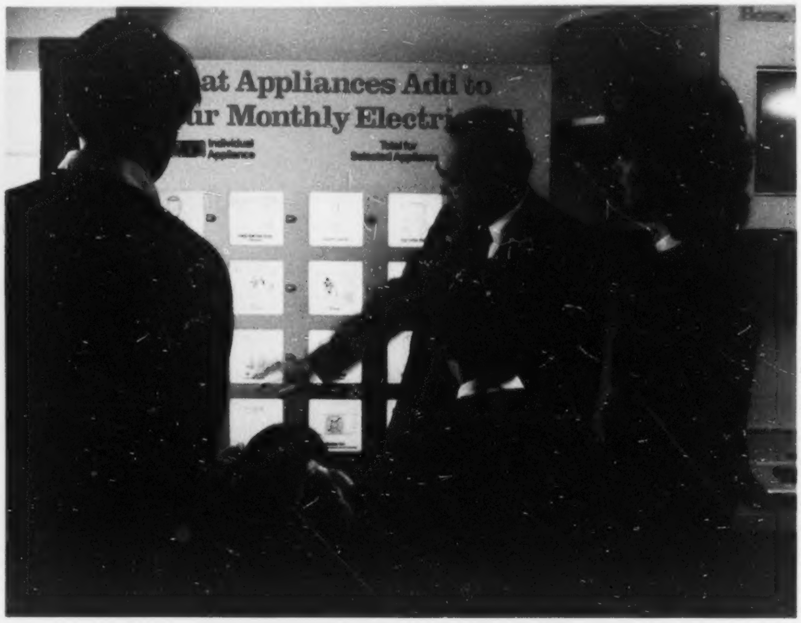
Finally, with community betterment programs, we find customers in the youngest and oldest age brackets, those with incomes of less than $20,000 annually, young married couples with children, customers with relatively high monthly electric bills ($126 or more), and black respondents are more likely than other customers to think these programs are highly important.

Importance and Performance Ratings

In the second set of questions that we presented in the national survey, eight categories of programs that could demonstrate concern and caring were tested further to examine the importance and performance ratings residential customers give them. The eight categories, which are similar to a great extent to the seven underlying dimensions we've just discussed, include:

- Cost-control programs,
- Service reliability,
- Emergency repair service,
- Bill payment programs,

Boston Edison Company



Dawson Jones/The Dayton Power and Light Company

Above, left:
Service reliability and emergency repair service are important to all demographic groups—and they all think utilities do an excellent job.

Above, right:
Free information on the electricity usage of different appliances appeals to varying customer segments.

- Customer involvement programs,
- Informational programs,
- Educational programs, and
- Community betterment programs.

Through the ratings customers gave, we generated a kind of perceptual map (see Table 3) that simultaneously plots the importance to customers of the eight programs, as well as customers' perceptions of their electric company's current performance in each area.

Looking at the upper right quadrant, we see that customers overall attach the greatest importance to service reliability and emergency repair service. Happily, we also see that customers give electric companies the highest performance ratings in these two areas. Thus, there is an excellent match between importance and performance; clearly, companies must maintain their position in these more traditional service areas.

The upper right-hand quadrant also suggests that electric companies are in a good position on bill payment programs. Although performance ratings are lower here than for service reliability and emergency repairs, so are importance ratings. There is a substantial equilibrium between customer expectations for bill payment programs as measured by importance ratings and customer satisfaction with company offerings in this area as measured by performance ratings.

Cost-control programs, on the other hand, fall just below the crossing of the axes. Customers see company performance as significantly lower than the rated importance of these kinds of offerings.

This gap between importance and performance indicates a clear need for companies to initiate and expand their efforts in this area, particularly for those customer segments that want these options most. When we look at the upper left quadrant, we see that free information and advice to customers rates higher than average on performance but is less important overall.

The three programs in the lower left quadrant—community betterment programs, customer involvement programs, and educational programs—are low on both importance and performance. In the case of community betterment programs, the value customers assign to these kinds of programs and activities is even lower than the performance ratings. For customer involvement and educational programs, low ratings on both dimensions are in basic equilibrium.

Although this perceptual map is helpful in clarifying utilities' overall position with the various kinds of programs and activities tested, it does not mean that those in the lower left quadrant should be eliminated. To the contrary, for *certain kinds of customers*, programs and activities in these areas are very im-

Alabama Power Company

Mason Morfit Eastern Utilities Associates

Financial incentives for conservation measures (left) and educational programs to teach children about electricity (right) rate well with some people.

portant. The challenge for an electric company is to create for its particular mix of customers a range of services that truly demonstrates a commitment to concern and caring and to market these services to the customer segments that are most responsive to them.

Customer Trade-Offs

In the third set of questions, we used a special procedure called conjoint—or trade-off—analysis to evaluate further six kinds of concern and caring programs: free information or advice to customers, educational programs, customer involvement programs, community betterment programs, programs to help customers control their electricity costs, and bill payment programs.

Specifically excluded were questions relating to the two traditional service attributes—service reliability and emergency repairs—because customers are quite satisfied in these highly important areas. It is absolutely necessary for electric companies to maintain the highest possible performance standards here as they are the backbone of competitive success.

Analysis of the survey data shows that all six remaining types of company programs and activities have a significant impact on customers' beliefs about how concerned an electric company is about them. Whether or not a company has these types of programs can account for as much as a 52-point difference (on a scale of 0 to 100) in customers' ratings of a company's level of concern and caring.

Bill payment programs and cost-control programs are the two most important. These are followed in order by three programs of nearly equivalent importance—customer involvement programs, informational programs, and educational programs. Community betterment programs have the smallest impact.

Nevertheless, customer involvement programs, informational programs, educational programs, and community betterment programs each have a significant value in their own right and particularly when taken together. Movement from no programs to some programs in all of these four areas would lead to a 15-point increase in customer ratings. Movement from no programs to many programs would be worth a 26-point increase.

It is worth repeating that, while bill payment programs and cost-control programs score best in shaping customer perceptions of company concern and caring, all six of the programs tested have a particularly significant impact on the perceptions of *certain targeted segments* of residential customers.

The Concern and Caring Component

The challenge facing electric companies is keeping their customers despite a widening circle of competition. To win the competition, companies must become superior service organizations that use customer segmentation analysis to plan and market a wide range of concern and caring programs and activities. The first step is to talk with customers themselves.

Electric company managers must find out what their customers want and what they value in customer service. Who really wants to be more involved with the company's various decision processes and how? Who really wants which kinds of information or advice about how best to use electricity? Who really wants to participate in various bill payment programs? Who really wants to participate in programs to control their use of electricity and their bills?

Through the Residential Customer Program Segmentation Study, it is clear that a wide array of customer service or concern and caring programs and activities needs to be developed by every electric company. One bill payment program may help only 4 percent of a company's customers, while another may help only 3 percent. Five percent of the customers may want information and advice in one area of vital importance to them, and 1 percent may want it in another area. But all of these small percentages add up, and, pretty soon, if the marketing of these services is done well, more and more customers will begin to feel that their electric company does indeed care.

And, based on the results of this study and the earlier Residential Customer Market Segmentation Study, if customers increasingly see their electric company as concerned about them and as helping them, good things will happen. They will feel more satisfied, they will be loyal, and they will be more receptive when rates must go up. With satisfied customers, you will have the most powerful weapon you need as deregulation and competition arrive.

Thank you!

All of us at Cambridge Reports are delighted that you, through Edison Electric Institute, selected us to conduct your recent "Residential Customer Market Segmentation Study" and "Residential Customer Program Segmentation Study."

These two research projects form the basis of the articles "How to Earn Customer Satisfaction," in this issue of *Electric Perspectives*, and "Why You Need Satisfied Customers," in the Summer issue.

If there is one thing we've learned in our 13 years of research experience—including more than 600 studies for over 100 utilities in areas like customer service evaluation, marketing, demand-side management, communications, and supply-side planning and forecasting—it is that customer attitudes and expectations are constantly changing.

Well-designed customer research like EEI's is the surest route to understanding these changes, meeting the challenges they present, and ultimately profiting from them.

We are proud and grateful to be part of this research effort.

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EP

Robert A. Szalay and Herbert M. Fontecilla

Standardizing Nuclear Power Plants

Packaged with licensing reform, it's the best way to put nuclear energy back on track.

Nuclear energy provides more than 15 percent of America's electricity, with more than 100 nuclear power plants now licensed for operation. Their total generating capacity is over 75,000 megawatts.

To date, commercial nuclear power in the United States has saved the burning of more than 1.6 billion barrels of oil. In the past decade, it has saved consumers between $35 billion and $56 billion, when compared to the cost of electricity generated by oil or coal that they would have otherwise consumed. These savings continue to mount at the rate of about $2 billion a year.

With the U.S. economy expanding and the demand for electricity rising, utilities are now planning for new generating capacity that will be needed in the 1990s and beyond. Only two domestic energy resources can be counted on to meet the expected electricity demand requirements for the foreseeable future: coal and nuclear.

However, all the nuclear plants currently operating in the United States or under construction were ordered in the late 1960s and early 1970s. No nuclear plant has been ordered since 1978, and many of those ordered in the mid-1970s have been canceled. There are three primary reasons for this situation: diminishing energy needs, excess generating capacity, and inordinate increases in the cost of the plants. Each of these interrelated problems has a complex history behind it. For example, cost overruns have been caused by inefficient management and quality assurance practices, failure to maintain construction schedules, design changes and additions, high inflation rates, and obstacles created by the regulatory process, among others.

The average construction cost per net kilowatt (electric) of generating capacity for the 13 nuclear plants that entered commercial operation from 1971 to 1974 was $313 (in nominal dollars). For the 13 plants that entered commercial operation from 1981 to 1984, the average construction cost per net kilowatt was $1,229; and the cost is estimated to be over $3,000 for the 11 plants expected to start operations in 1986. It took only five to six years to build the nuclear plants that began commercial operation in the early 1970s; it took over 12 years for the units placed in operation in 1985.

Thus, from a business perspective, nuclear power is often perceived as a financially risky investment and not a viable option at this time. Nuclear energy, however, should not be considered a mere "option." It is a technology that our country cannot afford to lose. It is "essential," and we need to find a way to make it viable again. The national security, economic, and environmental drawbacks of relying only on coal as a long-term domestic energy resource for baseload electricity generation are far too great to allow nuclear energy to disappear.

Obviously, some things need to be changed if nuclear power is to be revitalized and made attractive once more to utilities, the financial community, and the public at large. We believe that the further development of standardized nuclear power plants, combined with the updating and improving of the licensing process, will provide a powerful stimulus. However, while no one factor is solely responsible for the nuclear industry's difficulties, no single remedy will produce the necessary cure. The benefits of standardization will not be realized without comprehensive changes to the licensing process.

The Need for Standardization

At its most basic, standardization of nuclear plants means using the same design features repeatedly. Standardization can take the form of a "reference design" for an entire plant, or a major portion of it, that is reviewed and approved in advance by the Nuclear Regulatory Commission (NRC), then built at different sites by different utilities. Standardization can also mean a number of utilities agreeing to share and "duplicate" a particular plant design at a number of sites, or it can mean a utility opting to "replicate" a plant that it or another utility built previously. A modular system built at a central manufac-

Robert A. Szalay is a senior vice president at the Atomic Industrial Forum (AIF) and is responsible for AIF's Reactor Technical and Regulatory Program.

Herbert M. Fontecilla, a regulatory consultant for Virginia Power, has been a major contributor to the work of the AIF Study Group on the Practical Application of Standardized Nuclear Power Plants in the United States.

John Zoiner/Uniphoto

Cost overruns, regulatory snags, and construction delays have derailed the nuclear industry.

turing location under a "manufacturing license" and then transported and installed at a number of sites is also a form of standardization.

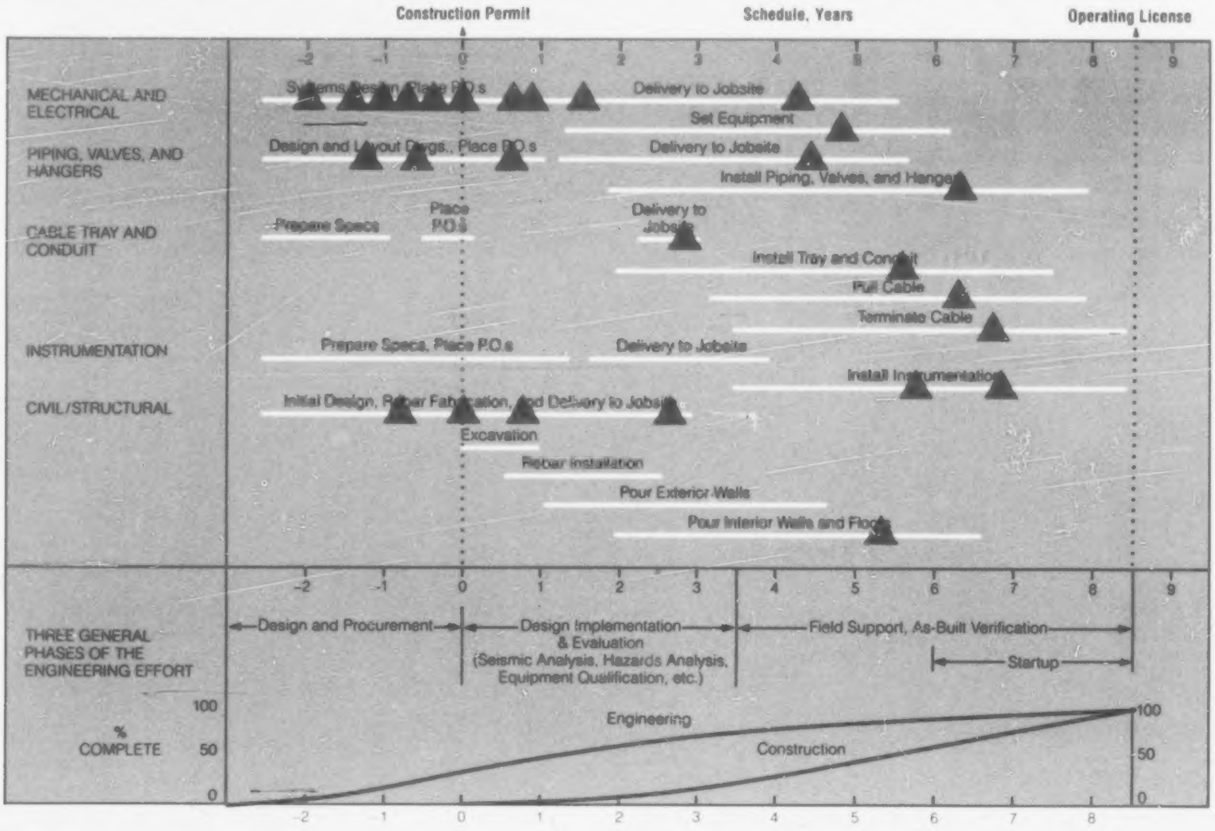
All of these variations share the benefits of standardization: the design cost is amortized among a number of buyers; construction and operating experience is shared; and ideally, the design undergoes licensing review only once. Most importantly, standardization will further enhance plant safety, which in turn should improve the nuclear power industry's public image and acceptance. Financial savings would result from shared engineering services, common specifications, reduced construction schedules for multiple units, construction and operating learning curve benefits, and increased availability of spare parts. Finally, standardization could help regain the confidence of investors and ratepayers by minimizing rate increases, maintaining construction schedules, and enhancing the efficiency and safety of the plants.

The concept of nuclear power plant standardization is not new. In 1973, Offshore Power Systems filed an application with the NRC to manufacture eight floating nuclear plants, and Commonwealth Edison Company applied for the duplicate plants at the Byron and Braidwood sites in Illinois. Twelve more applications followed in 1974 for a total of 26 units. Since 1973, over half of the applications for construction permits have involved one or more of the standardization options. Unfortunately, the many plant cancellations in recent years have foiled these efforts. Of the 23 reference design

Figure 1

Nuclear Power Plant: Typical Engineering and Construction Schedule

Red Triangles Show Impact Points of Hypothetical Backfit of Small External Reactor Coolant Clean-Up System Late in Construction.



applications, only two reached the final design stage: General Electric Company's GESSAR II and Combustion Engineering Incorporated's CESSAR. The GESSAR II design is incorporated in the Grand Gulf plants in Mississippi, and the CESSAR design is the basis for the Palo Verde plants in Arizona.

Current Regulatory Process

We believe that standardization will be a necessary and effective, albeit not the only, stimulus to make nuclear power attractive once more. However, standardization and today's regulatory maze are incompatible.

The Atomic Energy Act of 1954 established the bases for the licensing process for nuclear power plants, and the NRC currently implements it. According to this process, an applicant must first request a construction permit from the NRC. Once the NRC reviews the application, which contains preliminary information on the proposed plant design and site characteristics, it must be subject to a public hearing. Once the construction permit is issued, the final design is then developed in parallel with the construction of the plant. When the plant is near completion and most parts and components have been procured, delivered, and installed, an application for an operating license is submitted to the NRC. Before the operating license is granted, the NRC reviews the application and a second public hearing is offered. This second review and hearing cover not only the final design of the facility but also the construction process, testing of installed equipment, quality assurance and control programs, proposed operating procedures, emergency plans, and conformance with regulatory design changes since issuance of the construction permit.

As the result of the second review and hearing, design modifications, additional reviews and inspections, and construction delays may occur just as the plant nears completion and the utility prepares to bring it into service and recover its investment. It is this second review and hearing that impose a high level of uncertainty and instability on the licensing process.

Design changes and cost increases go hand in hand. As illustrated in Figure 1, the typical flow of time and engineering and construction activities for a nuclear power plant proceeds generally in three phases: 1) design and procurement, 2) design implementation, and 3) field support and as-built verification. The details of this figure[1] are not as important as the overall perspective it presents. In the absence of repeated changes in design requirements, this flow proceeds quite smoothly; in fact,

Fred Kligman Foto, Inc

Bills now on the Congressional agenda call for such improvements as the pre-approval of plant sites.

U.S. industry experience in building plants in foreign countries where designs are not significantly altered during construction proves this point. The introduction of design changes, or backfits, to this process disrupts the systematic approach and causes each phase to be revisited. The imposition of a single hypothetical backfit late in construction is also illustrated in the figure—the example used is the addition of a small external reactor coolant clean-up system. The red triangles show where the design and construction work force must be re-deployed for the analysis, procurement, delivery, and installation of new equipment throughout the three phases. Serious inefficiency, time loss, and extra cost are the result.

Even worse, backfits disrupt quality assurance procedures and make them extremely complex. Failures of the quality assurance program, even in limited areas, raise questions about the adequacy and safety of the plants, which in turn can result in further reviews and backfits. It is instructive to visualize the further complications of simultaneous multiple backfits.

Proposed Legislative Changes

Clearly, the regulatory process needs to be substantially modified. Its instability and unpredictability are a major disincentive to the continued use of nuclear energy in the United States.

Since 1982, members of Congress have proposed several changes to the Atomic Energy Act, and at least three such bills are currently pending on the legislative agenda. These bills would allow for the pre-approval of plant sites and provide regulatory stability. Most importantly, these proposals would facilitate the use of standardized designs and allow the NRC to issue a construction and operating license in a one-step process. A one-step licensing process would assure the applicant that, if construction is completed in accordance with the terms of the license, the plant will be permitted to operate without the possibility, as under the present system, that operation may be postponed indefinitely.

Certification of Standard Designs

The proposed legislation would also allow the NRC to issue formal approvals or certifications for standard nuclear power plant reference designs. In the past, the NRC has approved standard designs, but these approvals were based solely on the NRC technical staff's review and were subject to challenge in the public hearings for applications involving a reference design. The proposed certifications would be granted following not only the technical review of the applications but also appropriate proceedings—most probably through rulemaking. As such, standard design certifications would not be subject to litigation in individual licensing hearings.

The NRC currently has the authority to issue design certifications or similar approvals, and recently it has indicated that it is willing to do so. However, the process needs a more definitive approach, and the necessary regulatory changes have not been initiated. The proposed legislative actions would provide a clear defi-

General Public Utilities

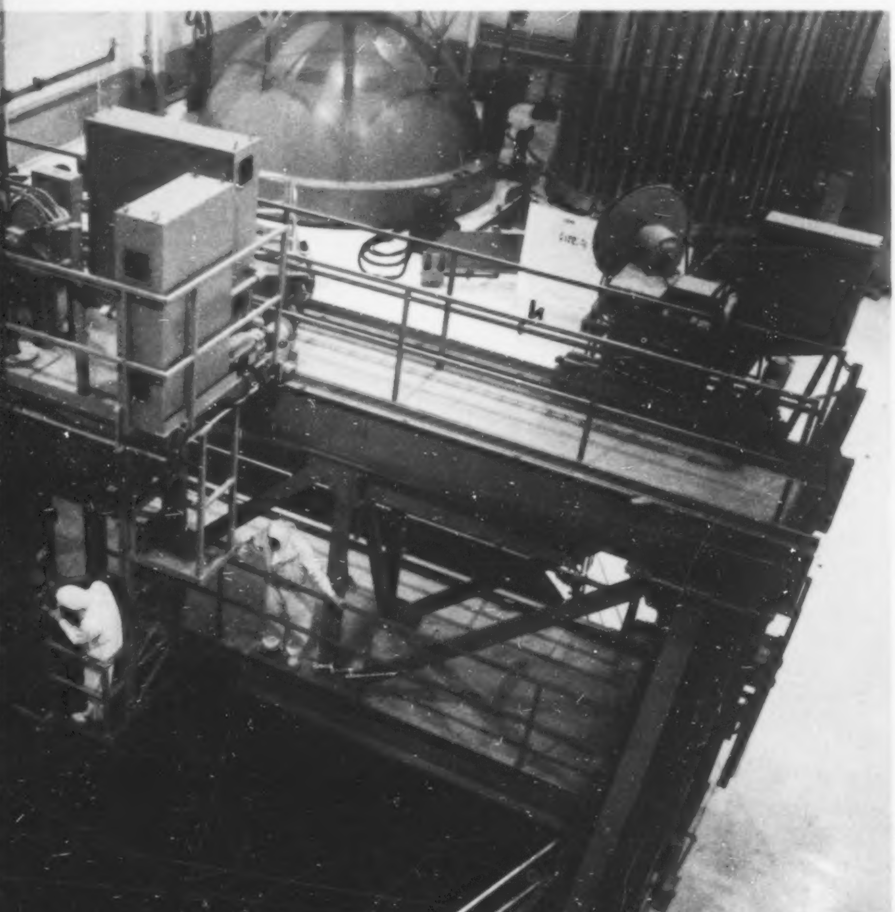
Standard designs will make it easier to train workers and to maintain and operate a plant. Above, workers mount a process pump during a planned outage. At right, General Electric's boiling water reactor teaching center gives hands-on experience in refueling and maintenance.

nition and a statutory basis for the issuance of standard design certifications.

Proposed Regulatory Changes

Recognizing the need to provide Congress and the NRC with support for their initiatives and to share the industry's experience, the Atomic Industrial Forum (AIF) established in March 1985 the AIF Study Group on the Practical Application of Standardized Nuclear Power Plants in the United States. The members of the Study Group represent a broad spectrum of the nuclear industry, including utilities, nuclear systems designers and manufacturers, architect-engineers, and consultants. In fact, the chairman initially was John E. Ward, vice president of Management Analysis Company, and is now Richard B. Priory, vice president, Design Engineering Department, at Duke Power. The work of the group is significant in that a consensus has been reached among the different segments of the industry with different problems and interests.

In a position paper submitted to the NRC in March 1986,[2] the Study Group is endorsing the proposed legislative changes and the issuance of standard design certifications. However, the Study Group states in no uncertain terms that these changes alone, although necessary, will not be sufficient to restore stability and certainty to the licensing process or to promote standardization. For this reason, the Study Group is urging the NRC to take an additional and complementary series of actions that would support and encourage the development of standardized nuclear power plants, namely to:



Pacific News Bureau

1. *Eliminate undisciplined rereview of standard designs*—The NRC should enforce a strict no rereview policy of preapproved designs, with rereviews allowed only when significant new information raises questions regarding the safety of the design. The backfit rule[3] provides the basic guidelines and framework for such a policy, but it is not explicit with regard to standard designs. The Study Group makes recommendations regarding methods for the application of the backfit rule to standard designs and for the effective review and processing of standard design applications.

2. *Restrict adjudication of previously resolved issues*—The most significant advantage of the proposed design certifications is that the characteristics of the design would not be subject to challenge in public hearings for applications involving a reference design. Similarly, once a certification is issued, the design cannot be modified without reopening the design certification proceeding. The Study Group recommends that these proceedings not be reopened unless clear and specific criteria are met. These criteria should include the need for new and relevant information to become available and for a *prima facie* showing that a design modification is necessary to maintain the

Bob Daemmrich/Uniphoto

Public input under one-step licensing can be based on complete plant designs.

required assurances that the public health and safety are reasonably protected. The NRC's total commitment to follow such criteria would be necessary for the industry to proceed with the expenditures that would be required to submit applications referencing standard designs.

3. *Extend and renew standard design approvals*—The NRC updated its policy statement on standardization in 1978. At that time, it extended the terms of effectiveness for some of the standardization options from three to five years. Based on arguments similar to those the NRC used at that time, i.e., increased experience with standardization and confidence in the safety of nuclear plants, the Study Group recommends that the life terms of all standardization options be extended to ten years, with possible extension beyond the ten-year period. The current effectiveness periods are unnecessarily restrictive because they may limit the ability of some designers to develop their portions of the plant before the approval for other sections of the design expire (e.g., an architect-engineer developing a balance of plant design to mate with an approved nuclear systems design). The recommended extensions and renewals are consistent with those included in the proposed legislation.

We cannot overemphasize that the potential benefits of standardization will not be realized without a revision of the regulatory process. The changes to the regulatory process proposed by the Study Group are based on industry experience gained through the last three decades, and we believe that they will result in a more efficient and effective disposition of NRC functions.

Public Participation

Some factions worry that the proposed legislation and the Study Group recommendations will jeopardize public participation. Such criticism is not warranted. The proposed revisions are designed to produce a more efficient and stable licensing process and will enhance public participation in a positive manner.

In the current process, a public hearing is held either when only preliminary design information is available or after the facility has been built and changes are either not feasible or very costly. The proposed one-step licensing process would provide hearings based on completely characterized designs before construction is started and when it is feasible to make changes efficiently. Hearing opportunities would be provided to cover all safety aspects of the plant and their interfaces before a utility invests enormous financial resources and energy planning margins in building the facility. Moreover, the design certification and one-step licensing hearings would not only be supported by a much fuller information base than is now the case, but will no longer take place under the distorting pressures generated when hearings are held after a multi-billion-dollar facility has already been completed.

Industry Responsibilities

For standardization and the proposed regulatory process to work, applications for design certifications and one-step licensing must include all the information necessary to describe the designs, their construction, and their operation. The Study Group is urging the NRC to develop detailed guidance on the level of detail necessary to make the necessary safety evaluations and has offered the assistance of experienced industry groups to work with the NRC staff on this

David Falconer Folio, Inc.

Standardization will further enhance safety on all fronts.

task. The design information expected to be contained in applications for design certifications and one-step construction and operating licenses would support equipment procurement and include qualification, installation, and testing procedures fully defining the requirements for implementation. However, nameplate information would not be available.

In the past, design information of a more preliminary nature was furnished at the front end of the licensing process, leaving open the potential for significant changes during construction or at the operating license stage. Under the new process, design engineering would be essentially complete, the regulatory requirements thoroughly defined, and public input incorporated before construction of the plant begins.

Bob Daemmrich Uniphoto

The NRC must change the regulatory process if standardized plant designs are to work.

The design certification and one-step construction and operating license applications would also need to include a description of the applicable inspections, tests, and analyses and their acceptance criteria. During construction, a series of confirmatory sign-as-you-go audits would be performed. These audits would assure that the plant was built consistent with the preapproved criteria and that the specified tests were completed satisfactorily. Upon completion, the plant would be allowed to begin operation. Only new issues that could potentially affect the safe operation of the plant and that meet the specified stringent criteria described above could be raised after the plant has been built and prior to its operation.

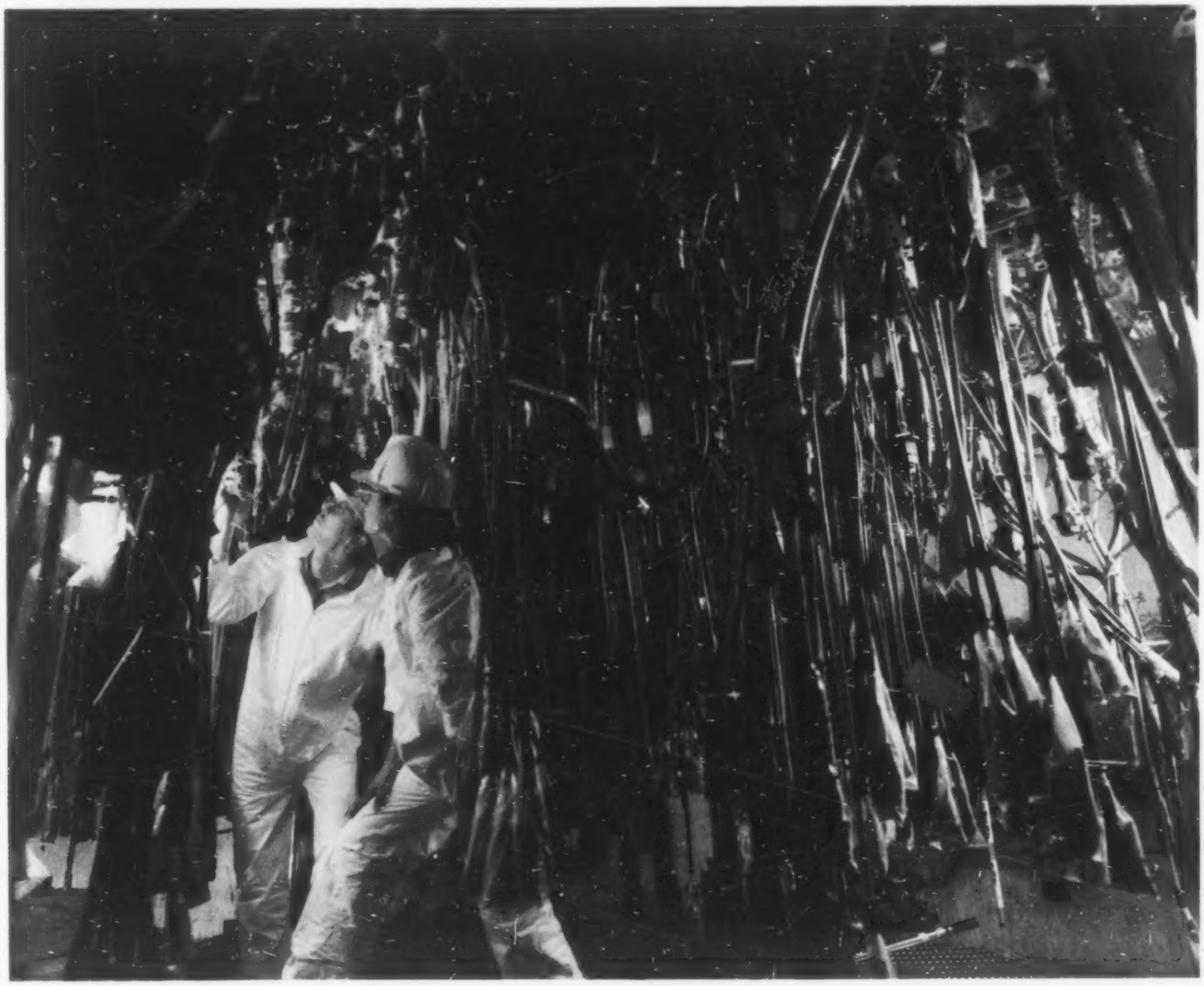
Development of this kind of application for a complete plant would require plant designers to make a large up-front expenditure of capital, estimated at $150 to $200 million. The industry—designers and utilities alike—would also need to avoid making costly customized changes to a standard design. This restraint is the price the industry must pay to benefit from standardization.

Cost Benefits

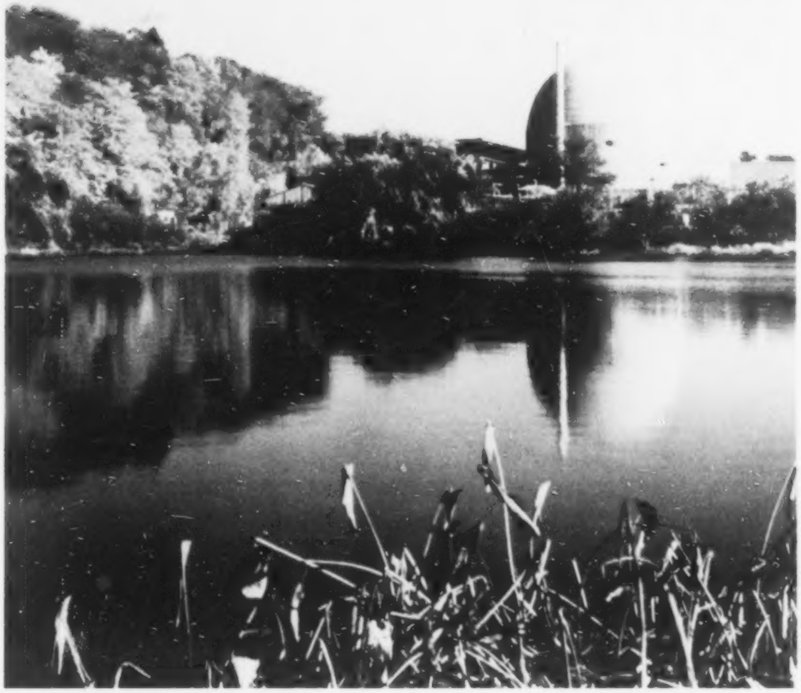
The capital costs needed to build a commercial nuclear power plant in the United States have risen tenfold in the last 20 years. Many of these cost increases are the result of construction times that have more than doubled and of multiple design and regulatory changes. The use of pre-approved standard designs in conjunction with one-step licensing and other improvements in the regulatory arena would result in substantial cost reductions. These cost savings, together with potential alternative organizational arrangements for building and operating future plants, innovative financing and risk sharing approaches, and more predictable working relationships with public utility commissions, would provide the necessary assurance that a plant owner will recover all reasonable expenses and earn a profit.

The most significant cost reductions would be found in shortened construction schedules. Assuming a conservative schedule of 72 months from construction authorization to commercial operation, it is estimated that the allowance for funds used during construction

Design changes and cost increases go hand in hand. What's worse, backfits disrupt quality assurance procedures.



The Cleveland Electric Illuminating Company



Robert D. Randolph/Northeast Utilities

Commercial nuclear power saves customers $2 billion a year in fuel costs. Why not set the stage to mine nuclear energy's potential for even wider benefits?

(AFUDC) costs could be reduced by half. A shortened construction schedule could also result in substantial reductions in escalation costs. Further savings would result from the amortization of the design cost among several utilities. The availability of the complete design prior to construction would also lower costs by allowing for more efficient construction practices, higher construction productivity, and the use of modularization. Standardization would further lower costs through expedited licensing reviews and more efficient personnel training, maintenance procedures, spare parts programs, and overall plant operations.

Safe Plants

Much of the argument on standardization has focused on its economic benefits and on associated procedural improvements. However, safety will also be enhanced. We can expect safety to benefit as a result of plant designers concentrating their efforts prior to licensing and construction, free of construction schedule pressures and regulatory changes. Standardized quality assurance programs, uniformly implemented, would also result in better construction practice and increased safety.

We also expect that the necessary large up-front investments will be spent only on the best, most efficient, and *safest* designs.

In addition, the proposed regulatory process would allow for more independent and effective reviews by the NRC, with staff interaction before the design is finalized. The process would be more conducive to beneficial changes and less conducive to band-aid type fixes, which would also contribute to increased safety.

Construction of standardized designs will not only benefit from improved procedures and quality assurance programs, but also from improved worker morale, off-site construction and installation, and standardized construction practices that should all contribute to enhanced safety. Finally, standard designs will facilitate and improve the training of personnel and the maintenance and operation of the plants.

Toward a Brighter Future for Nuclear Energy

Nuclear power is a crucial component of electric power supply in the United States, but its continued growth is uncertain at this time. We believe that standardization is the key to the revitalization of the nuclear industry. The development of standardized nuclear power plants will require large up-front investments to develop final designs before construction begins and strict avoidance of customized changes. The outmoded and no longer effectual regulatory process must be modified. The proposed statutory and regulatory changes will provide the basis for an effective, efficient, and stable regulatory process. The net results would be lower costs, more efficient operation, and enhanced safety. ■

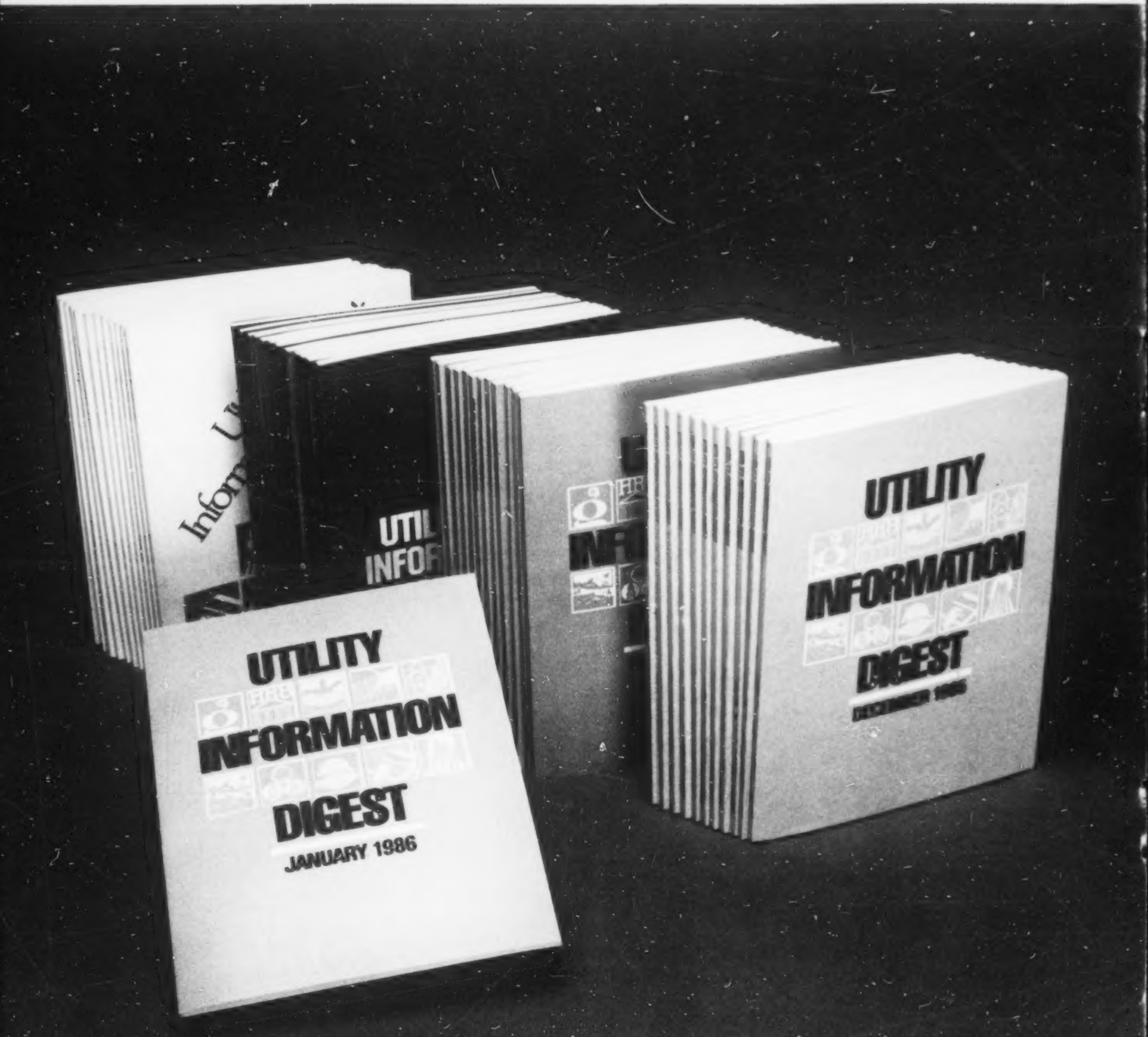
Notes

1. This figure is adapted from a December 7, 1982, presentation to the ACRS Subcommittee on Regulatory Policy and Procedures by J. H. Bell, Chief Nuclear Engineer, Gaithersburg Division of Bechtel Power Corporation, and then Chairman of the Cost-Impact Subcommittee of the AIF Committee on Reactor Licensing and Safety.

2. "Position Paper on Standardization," prepared by AIF Study Group on the Practical Application of Standardized Nuclear Power Plants in the United States, March 1986.

3. "Revision of Backfitting Process for Power Reactors," Nuclear Regulatory Commission, Final Rule, 10 CFR Parts 2 and 50. Federal Register, Vol. 50, No. 183, September 20, 1985.

A LESSON IN TIME MANAGEMENT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REGULATORY REVIEW

PRUDENCE AND THE REGULATORY COMPACT

The regulatory compact is an implicit bargain between regulators and utilities that underlies the institutional structure for the supply of electricity by private investors as a public service. Under the compact, utilities are given an exclusive right—and assume a correlative obligation—to produce and sell electricity within a specified geographic area at rates that will provide a fair return on their prudently-made investment. In exchange, the rates and operations of utilities are regulated to achieve the lowest reasonable costs for utility services consistent with a fair return for the utility.

Unmistakable signs of stress in a regulatory system that had long functioned smoothly have prompted examination of what has gone wrong and have caused concern in recent years as to whether the regulatory compact has been irrevocably broken. Recently, certain regulatory commission prudence decisions have been the most noteworthy signs of stress. In fact, Paul Levy, chairman of the Massachusetts Department of Public Utilities, says that the financial community now views prudence investigations as "little more than 'witch hunts' designed to confiscate properly invested funds from unsuspecting shareholders and lenders."

While prudence inquiries and prudence disallowances can occur on any utility operating expense or any capital investment upon which a return is sought, historically they have been most frequently encountered in the areas of fuel purchasing and plant outages. Until last year, there had been only three instances of prudence disallowances on completed plants, and two of those were on a tiny wood/waste fired plant in the Pacific Northwest.

Suddenly and dramatically, in 1985, the picture changed. In a trail-blazing opinion, the Missouri Public Service Commission examined in depth its staff's study of the construction of the Callaway nuclear power plant by Union Electric Company (UE) and disallowed, as imprudently incurred, $384 million of UE's investment. The staff's list of proposed disallowances (not all of which the PSC adopted) was extraordinarily detailed. The largest disallowances were for direct labor manhours and associated capitalized finance charges in excess of staff's recommended level of allowable manhours. But staff also proposed, and the PSC duly discussed, such novel items as disallowances for allegations that UE had 40 too many portable toilets on the construction site (rejected), that UE had incurred excessive costs for providing ice water to construction workers (accepted), and that UE had failed to monitor personal telephone calls from the site adequately (rejected). Consideration of such minute detail was unprecedented.

The Missouri decision was only the first of a wave of commission decisions. One recent example is the Michigan Public Service Commission's treatment of Detroit Edison Company's Fermi 2 nuclear plant. The PSC made disallowances totalling $397 million for 16 separate categories of expenditures. As in Missouri, the PSC's action was based on a staff study. The PSC disallowed, for instance, all project engineering costs in excess of 10 percent of the total project costs. Staff had concluded that 10 percent was a reasonable maximum and the PSC accepted it. Half of the overhead and indirect costs associated with the 1974-77 construction shutdown at Fermi were disallowed. Although "the decision to shut down the project was probably sound," the PSC said, "preceding events were the result of poor management decisions." More costs were disallowed for "overconstruction" of two cooling towers at the plant. Detroit Edison, having initially planned to use once-through cooling with intake and discharge from Lake Erie, switched to cooling towers in 1970 to avoid possible environmental litigation. The PSC concluded that Detroit Edison had been "indecisive" and had "overreacted to environmental fears."

These two examples illustrate a number of characteristics of current prudence inquiries. First, the inquiries focus on enormous, bewildering masses of detail. Second, they demand very large commitments of time and funds by the commissions involved; for instance, the New York Public Service Commission's investigation of Long Island Lighting Company's Shoreham nuclear plant began in May 1979 and was completed in December 1985. Third, inquiries try to evaluate management decisions years or even decades after they are made. Fourth, contrary to traditional legal concepts of prudence, commissions use hindsight; they know the results of a utility's actions, assign fault, and rationalize the preconceived notion that the utility was wrong. Fifth, commission decisions appear to be politically motivated value judgments; such decisions break the regulatory compact.

The traditional standard for evaluation of a utility's conduct is the "reasonable man test." An often-quoted articulation of the standard derived from a 1979 New York PSC order is that:

> The company's conduct should be judged by asking whether the conduct was reasonable at the time, under all the circumstances, considering that the company had to solve its problem prospectively rather than in reliance on hindsight. In effect, our responsibility is to determine how reasonable people would have performed the tasks that confronted the company.

The Federal Energy Regulatory Commission (FERC) discussed the standard at length last year. Utility managers, FERC emphasized, had "broad discretion in conducting their business affairs and in incurring costs necessary to provide services to their customers." Such costs would be deemed prudent if they were "costs which a reasonable utility management . . . would have made, in good faith, under the same circumstances, and at the relevant point in time." Although "in hindsight it may be clear that a management decision was wrong," FERC's review would focus "on the particular circumstances existing either at the time the challenged costs were actually made, or at the time the utility became committed to incur those expenses."

As articulated by both the New York PSC and FERC, the standard disclaims the use of hindsight and requires viewing a case prospectively in terms of circumstances existing at the time of the action under review. Although almost all commissions and their staffs give at least lip service to this standard, their decisions use fuzzy language and frequently have no clearly stated basis for why a given utility action is wrong, i.e., why a "reasonable man" would not have chosen the utility course of action.

Alfred Kahn, former chairman of both the New York PSC and the U.S. Civil Aeronautics Board, now a professor at Cornell, speaks of "mammoth disallowances . . . principally on the basis of hindsight, in most instances without even pretending to demonstrate imprudence . . . often in effect by applying impossible standards of perfection to managerial performance." Regulators, says Lewis Perl, a senior vice president of National Economic Research Associates, "judge utility investment by results, not reasonableness." Imprudence decisions "seem noticeably at variance with the facts." The bottom line for Perl is that "regulators are simply unprepared to pass the high costs of nuclear power on to consumers and are prepared to make whatever disallowances are necessary to bring those costs into line" with what the public is prepared to pay. "In this case, the utility industry has been obtaining capital based on a false premise." That "false premise" is, ultimately, the traditional regulatory compact. And, indeed, Kahn calls the disallowances "the most flagrant violations of the compact."

If the regulatory compact is to survive, institutional changes will be necessary. Their nature was well expressed recently by Joseph Swidler, former chairman of both FERC and the New York PSC, as follows:

> A precondition to solving the long-range problems of the industry is to develop policies and procedures for risk reduction. It should not be necessary for a company to risk insolvency when it orders a new generating unit, even if it acts with prudence at every step. And an *ex post facto* prudency review with the fate of the company hanging in the balance until it is completed, whether the outcome is favorable or unfavorable, should not become a routine consequence of embarking on new construction.

It is imperative that commissions serve the consumer's long-term interest in maintaining the regulatory compact. Reasonable capital costs cannot survive the uncertainty and risk associated with regulatory decisions based on political opportunism rather than rational standards. If capital costs increase, as they surely will with a breach of the regulatory compact, the consumer will pay— and at much higher rates in the long run than if reasonable standards had been followed. ⚡

Contributed by the Rate Regulation Department of Edison Electric Institute.

FINANCIAL REVIEW

EARNINGS PER SHARE DECLINE 5.2 PERCENT; QUALITY OF EARNINGS IMPROVES AS AFUDC DECLINES

First quarter 1986 earnings per share (before extraordinary items) for the investor-owned electric utility industry fell 5.2 percent from the same quarter of 1985. First quarter 1986 earnings were 82 cents per share on electric operating revenues of $31.2 billion, compared to last year's earnings per share of 87 cents on revenues of $30.7 billion. This is the sixth consecutive quarter where per share earnings did not increase. Recent rate increases, a 12.6 percent increase in other income, and a 1.1 percent increase in sales to ultimate customers could not overcome (1) a 5.3 percent increase in the number of shares outstanding, (2) a 16.4 percent decrease in the allowance for funds used during construction (AFUDC), (3) a 4.2 percent increase in interest charges on long-term debt, and (4) a 3.8 percent decline in other utility operating income.

Twelve-month earnings were $2.95 per share, off 7.5 percent from the $3.19 per share the industry earned during the twelve-month period ending March 31, 1985. The return on average common equity (ROE) was 13.5 percent for the twelve-month period, compared to 14.6 percent for the twelve months ending March 31, 1985. The ROE was influenced by both the slight decrease in net income available for common and the increase in common equity.

Despite the decline in earnings per share during the first quarter of 1985, the quality of earnings, as measured by the amount of AFUDC in net income, improved. AFUDC as a percent of net income available for common declined to 36.8 percent in the first quarter from 43.9 percent one year earlier. During the twelve months ending March 31, 1986, AFUDC accounted for 43.8 percent of net income available for common, down from 49.3 percent one year earlier. Total AFUDC fell 16.4 percent from the first quarter of 1985 to the first quarter of 1986. The decrease in AFUDC is largely a result of the completion of several large construction projects within the past year. Additionally, AFUDC decreases have been caused by companies no longer accruing AFUDC on troubled or canceled plants.

Utility plant in service increased 17.0 percent to $260.1 billion from March 31, 1985, to March 31, 1986. Construction work in progress (CWIP) dropped sharply as the $102 billion on record as of March 31, 1985 decreased 17.7 percent to $83.9 billion this March. The drop in CWIP can be attributed to the completion of new plants and the accounting treatment of disallowed and discontinued plants during the past twelve months.

The industry took advantage of relatively low interest rates to refund $2.7 billion in long-term debt in the first quarter of 1986, according to Ebasco Business Consulting Company. Lower interest rates have enabled electric utilities to decrease the embedded cost of long-term debt from 10.15 percent during the first quarter of 1985 to 10 percent during the quarter ending March 31, 1986. In addition, companies used internally generated cash and long-term financings to reduce short-term debt.

Pre-tax interest coverage ratios were mixed for both the quarter and the year. The pre-tax coverage ratio with AFUDC was driven slightly lower by a decline in AFUDC. The coverage ratio without AFUDC increased, indicating that the decline in AFUDC outgained increases in earnings (before taxes and interest charges).

Pre-Tax Interest Coverage Ratios:

	First Quarter		Year Ended March 31,	
	1986	1985	1986	1985
With AFUDC	3.19	3.23	3.05	3.08
Without AFUDC	2.75	2.67	2.57	2.53

The downward trend in industry fuel costs continued in the first quarter of 1986 as fuel expense dipped 10.6 percent to $8.3 billion from $9.3 billion in 1985. This trend follows in the wake of declining crude oil prices and increased usage of nuclear generation. For the twelve-month period ending March 31, 1986, fuel expense was 36 percent of electric operating expenses, down from 39.3 percent in the previous twelve-month period.

The accompanying financial statements (Table 1 and Table 2) are based on unaudited reports submitted by a sample of investor-owned electric utilities. The sample is representative of approximately 94 percent of the industry's sales to ultimate customers and 93 percent of the industry's total assets. From this sample the data is then extrapolated to represent the entire investor-owned electric utility industry.

Contributed by the Finance Department of Edison Electric Institute.

Table 1

Investor-Owned Electric Utility Industry Statement of Income

(Unaudited)
(Millions of Dollars)

	Three Months Ending March 31,			Twelve Months Ending March 31,		
	1986	1985	% Change	1986	1985	% Change
Total Electric Operating Revenues[1]	$31,234	$30,660	1.9	$124,844	$121,521	2.7
Electric Operating Expenses						
Fuel	$ 8,270	$ 9,254	(10.6)	$ 36,047	$ 37,812	(4.7)
Other Operation & Maintenance	8,313	7,795	6.6	32,434	30,683	5.7
Depreciation & Amortization	2,774	2,472	12.2	10,618	9,495	11.8
Taxes Other Than Income Taxes	2,378	2,263	5.1	8,993	8,663	3.8
Income Taxes (Federal & Other)	1,523	1,274	19.5	5,618	4,741	18.5
Provision for Deferred Income Taxes	1,023	956	7.0	4,503	4,866	(7.5)
Investment Tax Credit Adjustment, Net	664	772	(14.0)	1,969	2,001	(1.6)
Total Electric Operating Expenses	$24,945	$24,786	0.6	$100,182	$ 96,260	4.1
Electric Operating Income	$ 6,289	$ 5,874	7.1	$ 24,662	$ 23,260	6.0
Other Utility Operating Income	752	782	(3.8)	1,442	1,531	(5.8)
Total Utility Operating Income	$ 7,041	$ 6,656	5.8	$ 26,104	$ 24,791	5.3
Other Income & Deductions—Net	$ 805	$ 715	12.6	$ 2,306	$ 2,204	4.6
Allowance for Other Funds Used During Construction	1,166	1,341	(13.0)	4,854	5,292	(8.3)
Total Income Before Interest Charges	$ 9,012	$ 8,712	3.4	$ 33,264	$ 32,287	3.0
Interest Charges						
Interest on Long-Term Debt	$ 3,774	$ 3,621	4.2	$ 14,791	$ 14,124	4.7
Other Interest Expenses & Charges	252	259	(2.7)	998	1,164	(14.3)
Allowance for Borrowed Funds Used During Construction	(640)	(820)	(22.0)	(2,754)	(3,263)	(15.6)
Net Interest Expenses & Charges	$ 3,386	$ 3,060	10.7	$ 13,035	$ 12,025	8.4
Net Income Before Extraordinary Items	$ 5,626	$ 5,652	(0.5)	$ 20,229	$ 20,262	(0.2)
Extraordinary Items	1	0	N.M.	(1,668)	(34)	N.M.
Net Income	$ 5,627	$ 5,652	(0.4)	$ 18,561	$ 20,228	(8.2)
Preferred Dividends Declared	715	732	(2.3)	2,870	2,926	(1.9)
Net Income Available for Common	$ 4,912	$ 4,920	(0.2)	$ 15,691	$ 17,302	(9.3)
Common Dividends Declared	3,073	2,955	4.0	11,870	11,313	4.9
Additions to Retained Earnings	$ 1,839	$ 1,965	(6.4)	$ 3,821	$ 5,989	(36.2)
Avg. Shares Outstanding	5,966	5,668	5.3	5,875	5,428	8.2
Earnings Per Share Before Extraordinary Items[2]	$ 0.82	$ 0.87	(5.2)	$ 2.95	$ 3.19	(7.5)
Earnings Per Share After Extraordinary Items[2]	$ 0.82	$ 0.87	(5.1)	$ 2.67	$ 3.19	(16.2)
Common Dividends Per Share[2]	$ 0.52	$ 0.52	(1.2)	$ 2.02	$ 2.08	(3.1)

NOTES:
[1] Revenues are adjusted for intra-industry sales for resale of electricity.
[2] Based on average shares outstanding as reported to EEI by survey respondents and adjusted for stock splits.
N.M.—Not Meaningful.
Percent changes may reflect changes due to greater detail/roundings.

Table 2
Investor-Owned Electric Utility Industry Balance Sheet
(Unaudited)
(Millions of Dollars)

Assets	**March 31, 1986**	**March 31, 1985**	**% Change**
Utility Plant*			
Utility Plant (Including Nuclear Fuel)	$356,481	$310,450	14.8
Less Accumulated Depreciation	96,414	88,129	9.4
Total	$260,067	$222,321	17.0
Construction Work in Progress	83,904	101,950	(17.7)
Net Utility Plant	$343,971	$324,271	6.1
Investments	8,682	8,077	7.5
Current Assets	39,294	37,905	3.7
Deferred Debits	18,884	18,979	(0.5)
Total Assets	$410,831	$389,232	5.5
Capitalization & Liabilities			
Capitalization			
Common Stock	$ 85,561	$ 81,038	5.6
Retained Earnings	46,668	43,190	8.1
Preferred Stock	31,093	31,775	(2.1)
Long-Term Debt	150,700	144,574	4.2
Total Capitalization	$314,022	$300,577	4.5
Current Liabilities			
Short-Term Debt	$ 4,011	$ 4,562	(12.1)
Long-Term Debt Due Currently	6,991	4,081	71.3
Other Current Liabilities	28,440	28,889	(1.6)
Total Current Liabilities	$ 39,442	$ 37,532	5.1
Deferred Credits			
Accumulated Deferred Income Taxes	$ 32,724	$ 28,779	13.7
Accumulated Deferred Investment Tax Credits	16,179	14,511	11.5
Other Deferred Credits	8,464	7,833	8.1
Total Deferred Credits	$ 57,367	$ 51,123	12.2
Total Capitalization & Liabilities	$410,831	$389,232	5.5

*Includes non-electric utility plant

TECHNOLOGY REVIEW

CONPRO—A COMPUTER SCREENING TOOL FOR DEMAND-SIDE MANAGEMENT ANALYSIS

Utilities and state public service commissions are examining demand-side management (DSM) programs increasingly as a way to meet consumer electricity needs reliably and at least cost. Unfortunately, comprehensive analysis of DSM in utility strategic planning is new to the industry, and managers often lack the tools and data necessary to do the job. Some sophisticated tools for such planning have been developed, but they typically require large amounts of detailed load data. The Alliance to Save Energy has developed CONPRO, a simple, easy-to-use computer program that screens DSM options for inclusion in strategic plans.

As a screening tool, CONPRO helps users make judgments about the economics of specific DSM options and the impact of conservation programs. CONPRO provides utilities a simple, comprehensive tool for screening conservation and load management options and programs. In addition, it yields information that can be used to check the implicit assumptions underlying utility energy and peak forecasts. Overall, CONPRO helps utility managers utilize end-use and conservation and load management option data to improve their DSM decision making.

CONPRO—for CONservation PROgram Impact Estimation Model—aids utility DSM planners in maximizing specific utility program goals. For example, it can determine the "optimal" amount of resources to spend on conservation and load management programs to accomplish specific objectives. While CONPRO can do complete program revenue requirement impact analyses, it has many features that allow the analyst to do partial or specific subanalyses. These features include the ability to:

- Evaluate impacts of DSM programs on utility loads, revenues, costs, rates, and revenue requirements.
- Calculate the magnitude of economic DSM alternatives to society or individual consumers and display the resulting load curves along with the utility's load forecast.
- Calculate DSM option costs of conserved energy (CCE) or costs of conserved demand (CCD). [The CCE or CCD equals the levelized cost of each kilowatt-hour or kilowatt saved over the life of the option.]
- Calculate and print, or graph, DSM supply or resource curves for any time period.
- Calculate market penetration of DSM alternatives over time.

To use CONPRO, two data sets are required: (1) a common set of utility customer class rates, end-use characteristics, energy and demand forecasts, discount rate distributions, and utility marginal costs, and (2) an inventory of conservation and load management options by customer class and end-use.

Data for CONPRO requires specification of DSM option characteristics and customer class end-use loads, but not in terms of detailed (i.e., hourly load) data. While many utilities have not yet developed the necessary data, most could develop it without a substantial investment by using in-house and secondary data. For example, each DSM option for a given customer class requires information on applicable end-use; investment type (i.e., retrofit, normal replacement, etc.); units per customer; unit incremental cost; useful life; percent of customers for which the option is technically applicable; current level of market penetration; year of DSM option market introduction; total, seasonal, and on- and off-peak energy changes; and summer and winter peak diversified and non-diversified demand changes. Customer class end-use data includes for each end-use the number of customers, customer growth rate, average customer energy and demand use by season, and load factors by season.

Two examples illustrate the type of analyses CONPRO can perform. First, for any customer class, the program will calculate and rank DSM options by their CCE or CCD. The CCE is expressed in cents/kilowatt-hour saved. The CCD is similarly expressed as dollars/kilowatt of summer or winter diversified peak savings. Table 1 shows the CCE and CCD values of some selected commercial and industrial DSM options in a case study conducted by the Alliance with General Public Utilities Corporation (GPU).

CONPRO can also estimate the amount of conservation and load management that is economic from either consumer or society perspectives. To accomplish this,

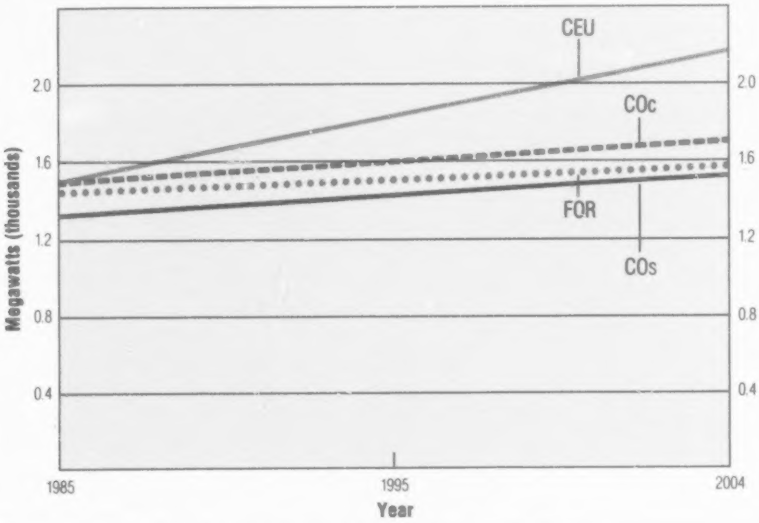
Table 1
Selected Commercial and Industrial DSM Option CCEs and CCDs for General Public Utilities Corporation (GPU) as Calculated by CONPRO

Customer Class	Option	CCE (¢/kWh saved)*	CCD Summer ($/kW saved)*
Commercial	1. Replace standard pump motors with high efficiency units	0.944	36.77
	2. Install heat recovery system for air conditioner	1.243	17.35
	3. Install economizer for central chilled water system	2.325	100.17
	4. Replace standard 40w fluorescent lamps and ballasts with high efficiency units	2.579	124.58
	5. Install reflective shading film for cooling	2.834	118.83
Industrial	1. Install furnace curtain	0.115	3.01
	2. Replace 100-250w incandescent lamps with high efficiency fluorescent units	0.322	12.55
	3. Replace standard motors with high efficiency units in continuous duty applications	0.802	22.08
	4. Install adjustable frequency drives in variable speed applications	1.154	31.78
	5. Replace 400w mercury vapor lamps and fixtures with high pressure sodium units in exterior lighting	8.047	148.38

These values compare with current GPU average rates for commercial of 6.2 cents/kilowatt-hour for energy and $9/kilowatt/month for demand and industrial of 4.8 cents/kilowatt hour and $7.20/kilowatt/month.

*Calculated at a 7.5 percent social discount rate

Figure 1
Illustrative Load Curves Produced by CONPRO
Metropolitan Edison Company
Summer Peak Demand: 1985-2004 (Preliminary Analysis)



data on the social discount rate and the discount rate distributions reflecting customer investment decisionmaking behavior for each customer class are established as inputs. For example, CONPRO allows each customer class to be characterized by up to seven different discount rate categories based on information about their investment practices.

Given the DSM option characteristics and the discount rate information, each option can be evaluated as to its economics for each customer class or for society as a whole. A DSM option is considered economic if its net present value is positive for the given discount rate. Options that are economic enter the market based on their replacement characteristics. Figure 1 illustrates for Metropolitan Edison Company, a subsidiary of GPU, the three load curves CONPRO produces and how they compare to the utility's load forecast for summer peak demand, which can also be displayed by CONPRO.

The top curve, labeled CEU (Constant Efficiency and Utilization), equals the load that would occur due to economic growth (i.e., population, new homes and appliances, etc.) with electric-using device efficiency and utilization held constant at 1985 levels. This curve is calculated and portrayed as a reference point and is useful for evaluating underlying assumptions. The second curve displayed is the utility's forecast (FOR). This forecast typically is derived by traditional econometric procedures.

CONPRO produces additional load curves from two different perspectives. The first curve, COc (Conservation Opportunity—customer), is the load one would expect if GPU's customers made all DSM investments they found economic. The second curve, COs (Conservation Opportunity—society), is the load one would expect if society invested in all DSM options it found economic.

The advantage of CONPRO is that it provides explicit information about DSM option economics. It allows the analyst to compare discount rate assumptions, market penetration, and other key variables implied in traditional econometric forecasts. For example, in this case the customer economic load forecast is above the societal forecast because we have assumed, for some customer categories, much higher investment hurdle rates for DSM options. Analyses with CONPRO can be extended to estimate actual market penetration rates of DSM options and the impacts of any conservation program that can be quantified as having an effect on DSM option profitability or cost.

CONPRO requires an IBM-compatible personal computer with 640K memory to operate. The program is available with an operator's manual from the Alliance to Save Energy, 1925 K Street, N.W., Suite 206, Washington, D.C. 20006. CONPRO's development was supported by General Public Utilities and the Pennsylvania Governor's Energy Council. A report describing the complete results of the project analysis done for GPU is also available.

Contributed by Douglas Norland, Senior Economist with the Alliance to Save Energy. The Alliance is a non-profit coalition of business, government, and consumer leaders dedicated to increasing energy efficiency.

STATISTICAL REVIEW

ELECTRICITY DEMAND WEAKENS AS ECONOMIC ACTIVITY SLOWS

The U.S. economy was the key determinant of the investor-owned electric energy market in the first half of 1986, just as it was in 1985. As the vigorous pace of economic expansion slowed in mid-1984 and has since continued at a much lower rate, so, too, has growth in electricity demand. In contrast to 1984, when sales by the investor-owned utilities increased by a healthy 5.8 percent, 1985 sales of 1,769 terawatthours were an anemic 1.9 percent higher than the year before. First quarter 1986 sales were equally sluggish, rising 1.1 percent over the first quarter of 1985. Indications are that second quarter 1986 sales will show a similar weak performance.

The small sales increases, together with the lowest dollar amount of rate relief granted since 1979, produced revenues for 1985 of $118.9 billion. Revenues rose by 4.9 percent for the year and 2.6 percent in the first quarter of 1986, less than half as much as in those periods in the previous year.

Flat-to-negative changes in industrial sales, which had been particularly robust in 1984, and only slight increases in residential demand accounted for the lack of overall market growth. Commercial sales, on the other hand, rose moderately last year, but in the first quarter their growth also slowed. Part of the divergence in the industrial and commercial growth rates resulted from one company making a major sales reclassification from the industrial to the commercial category during 1985. The percentage changes in the accompanying table have been calculated after adjusting the figures for the reclassification.

Unlike in some years, the weather's influence on electricity consumption in 1985 was neutral. However, relatively colder temperatures helped boost demand in the fourth quarter, while the slow sales growth in the first quarter of 1986 can be attributed partly to the relatively warmer weather.

Electricity and the Economy

After allowing for the effect of weather, changes in electricity sales followed the same pattern as changes in economic activity. However, electricity's growth has been somewhat less than that of GNP throughout the recent period (except in the fourth quarter when cold weather played its positive role). As the cyclical upswing from the 1981-82 recession progressed, almost all sectors of the economy saw extraordinarily rapid growth until mid-1984. GNP rose 6.5 percent in 1984. Industrial output, as measured by the Federal Reserve industrial production index less the electricity component, rose even more sharply by 11.9 percent. Industrial electricity sales, in turn, grew briskly, posting a 7.7 percent gain for the year.

By the second half of 1984, as domestic demand growth slowed with the maturing of the expansion phase of the business cycle, as world market prices of raw materials declined, and as the nation's trade position seriously deteriorated, the manufacturing, agricultural, energy, and mining sectors all began to have problems. Thus, growth of the overall economy abruptly slowed. GNP increases

Table 1

THE INVESTOR-OWNED ELECTRICITY MARKET AND ECONOMIC ACTIVITY

P = Preliminary

Sales to Ultimate Customers (Megawatthours):	First Quarter 1986P	First Quarter 1985P	Year 1985P	Year 1984P
Residential Sales	$158,245,096	$157,528,540	$ 573,267,306	$ 563,516,382
Commercial Sales	122,687,235	119,014,099	498,002,482	473,443,868
Industrial Sales	155,541,758	155,453,701	640,095,851	643,485,918
Other Sales	14,841,354	14,618,649	57,617,202	56,371,019
Total Sales	$451,315,443	$446,614,989	$1,768,982,841	$1,736,817,187
Total Revenues ($000)[1]	$ 29,912,104	$ 29,141,391	$ 118,891,120	$ 113,330,656

Percent Change From Previous Year:	Year 1984	1st Qtr 1985	2nd Qtr 1985	3rd Qtr 1985	4th Qtr 1985	Year 1985	1st Qtr 1986
Total Electricity Sales	5.8	1.3	1.4	1.8	2.9	1.9	1.1
Residential Sales	3.2	1.1	(0.4)	2.0	4.1	1.7	0.5
Commercial Sales, Adjusted[2]	6.3	3.6	3.2	3.8	5.5	4.5	2.2
Industrial Sales, Adjusted[2]	7.7	(0.2)	(0.6)	(0.4)	0.8	(0.1)	0.7
Real Gross National Product	6.5	2.9	1.9	2.1	2.1	2.2	1.9
Less Electricity Component	11.9	3.8	2.2	1.1	1.8	2.2	1.5
Housing Starts	2.7	(8.5)	(5.3)	0.8	10.0	(0.4)	13.2

Sales by Region (Megawatthours):[3]	First Quarter 1986P	First Quarter 1985P	Percent Increase	Year 1985P	Year 1984P	Percent Increase
New England	$ 22,775,960	$21,726,276	4.8	$ 80,585,832	$ 78,792,731	2.3
Middle Atlantic	66,906,404	65,173,318	2.7	247,376,897	245,882,491	0.6
East North Central	95,026,742	94,466,524	0.6	359,964,480	355,683,614	1.2
West North Central	26,269,202	26,296,330	(0.1)	103,880,848	102,623,137	1.2
South Atlantic	89,757,230	86,114,671	4.2	344,172,117	332,265,155	3.6
East South Central	19,152,081	19,158,618	0.0	78,233,055	75,950,527	3.0
West South Central	61,377,067	63,138,357	(2.8)	273,211,950	271,928,945	0.5
Mountain	22,879,256	23,185,533	(1.3)	92,267,142	89,302,492	3.3
Pacific	45,433,045	45,713,186	(0.6)	182,398,707	177,529,625	2.7
Alaska and Hawaii	1,738,456	1,642,176	5.9	6,891,813	6,858,470	0.5
United States	$451,315,443	$446,614,989	1.1	$1,768,982,841	$1,736,817,187	1.9

[1] Revenues from sales to ultimate customers only

[2] Excluding the industrial and commercial sales of one company that reclassified a major portion of its industrial sales to the commercial category in the second quarter of 1985

[3] U.S. Census regions

in each quarter of 1985 seesawed around the much lower rate of 2 percent, and industrial production growth decelerated even more. Similarly, total electricity sales grew at only a little over 1 percent, while industrial sales stalled.

Meanwhile, consumers continued to spend on services as well as on imports. Lower interest rates later in 1985 especially stimulated the housing sector, which earlier had been held back severely by high rates.

Housing starts jumped 10 percent in the fourth quarter and rose 13.2 percent further in the first quarter of 1986. Finance, insurance, and real estate activities all shared in the boom. Commercial electricity demand has reflected the service sector's strength. The increase in housing construction, on the other hand, apparently has not yet shown up in the residential electricity sales figures.

Regional Markets

The national electric power market is a mosaic of regional markets, each of them unique. With varying end use mixes, weather patterns, and economic influences, the regional markets tend to grow at divergent rates, both in the short term and the long term. In 1985, regional sales growth ranged from 0.5 percent to 3.6 percent. Despite this relatively wide disparity in growth rates, the fact remains that not even the faster growing markets have showed signs of really robust health.

Just as the various sectors of the national economy did not share equally in the growth of GNP, the lopsided nature of the expansion favored some regional economies, while causing serious difficulties in others. The consequences of economic structural imbalance were felt most heavily in 1985 in the East North Central industrial heartland, the West North Central farm belt, and the West South Central oil and gas producing region. All three regions had electricity market growth lower than the U.S. average. On the other hand, the South Atlantic, East South Central, and Pacific markets benefited from their more balanced, less industrialized economies, as well as from the long-term shift of industries and population to the Sun Belt. New England's high technology industries bolstered that region's electricity sales. In the Mountain region, healthy sales growth in the Sun Belt and defense industry states outweighed the depressed demand in the mining and agricultural states.

1986

At the beginning of this year many economic analysts were forecasting that a rebound in activity would occur and that GNP would perform better than in 1985, with growth ranging from 3.0 to 3.5 percent. Somewhat less optimistically, the electric utility industry predicted a sustained rate of growth in total generation of 2.4 percent, the same rate as in 1985. The rationale for the favorable outlook was that with lower energy prices holding inflation under control, real purchasing power of businesses and consumers would increase, leading to strong gains in spending. With the federal deficit eventually brought under control, interest rates would continue to decline, giving a further big boost to the housing market, where underlying demand is particularly strong as the baby boom generation comes of household-formation age. The continued diminishing of the dollar's strength *vis-à-vis* other currencies would bring about a steady improvement in the nation's trade balance. Improving industrial markets would stimulate a pickup in investment.

As of the first half of 1986, however, the expected revival of growth has not occurred. It is now estimated that GNP growth in the second quarter could be somewhat weaker than in the first quarter. Industrial production for the last few months through May declined slightly. Housing starts, although still relatively strong, have leveled off from their first quarter rapid rate as interest rates have recently inched upwards. Electricity sales figures for the second quarter are not in yet, but the weekly output statistics for the total electric utility industry, which in most periods display changes that parallel the sales changes, tell the same story of more sluggish growth. Output for the first half of the year (which also reflects the negative influence of the first quarter weather) was 1.3 percent above the first half of 1985. Output in the second quarter rose a little faster, at 2.7 percent above the same period in 1985.

Projections of longer term electricity demand by the Department of Energy call for moderate growth. The projections assume GNP will also grow moderately, and that electricity will continue to enjoy a competitive advantage over other forms of energy. This holds true especially in the industrial market, where new electrically based technologies are being introduced to increase productivity and where electricity is being substituted for other forms of energy to lower costs. However, this long-run advantage will not fully affect the electricity market until the short-term economic picture brightens.

Contributed by the Statistics Department of Edison Electric Institute.

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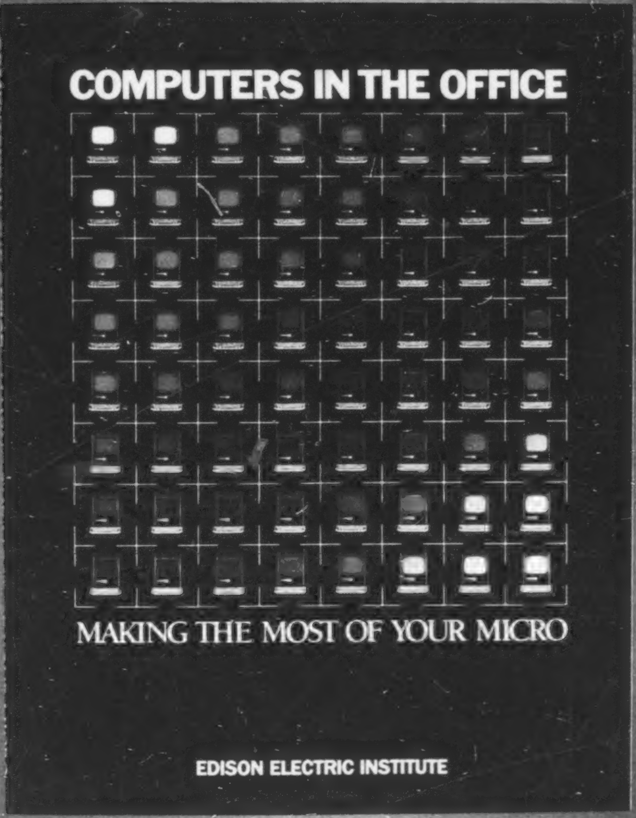
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BOOK REVIEW

WHO PROFITS: WINNERS, LOSERS, AND GOVERNMENT REGULATION

Robert A. Leone
Basic Books, Inc., 1986
New York, New York, 272 pp.

Reviewed by Bruce G. Humphrey

Government regulation is a major concern for anyone doing business today. In many cases, compliance is expensive and time consuming. During the 1970s and into the 1980s, a substantial body of literature addressed the question of how much regulation costs. Environmental regulation, health and safety regulation, and economic regulation all came under analytical scrutiny. A widely cited estimate of the aggregate compliance costs was $100 billion per year. This estimate became a driving force for efforts to improve federal regulation, efforts that have spanned three presidential administrations and that continue to this day. However, in *Who Profits*, Robert A. Leone effectively counsels us that this focus on aggregate costs which has drawn so much attention is perhaps necessary but not sufficient for effective analysis and planning by either government or business.

Leone has distilled this view from his considerable experience as an academician currently at Harvard's Kennedy School of Government, as a public policymaker while senior economist with the President's Council of Economic Advisors, and as a management consultant currently associated with a leading consulting firm. Much of his experience has been devoted to both the analysis and implementation of policy strategies for business and government in situations where regulation is a critical element. His message in *Who Profits* is clear and compelling:

> . . . Every act of government, no matter what its broader merits or demerits for society at large, creates winners and losers within the competitive sector of the economy. These gains and losses, which accrue to both individuals and corporations, become the object of intense political attention at the same time they help shape the nation's international competitiveness, impart a direction to its research and development programs, and generally help shape the direction and pattern of growth of our economic institutions. This outcome is so predictable that it constitutes virtually an Iron Law of Public Policy.

The implications of the Iron Law for business strategy are equally compelling. Certainly business must plan to satisfy regulatory requirements in a cost-effective manner. But this alone would be a passive response to the *fait accompli* of regulations already in place. If the Iron Law is true, as it certainly must be, then the regulatory process, from the emergence of an issue to the drafting of legislation to the promulgation of final rules, is an important consideration in the competitive strategy of any firm. Winners and losers, both across and within industries, will be consigned to their fates at each stage of the process. Although these fates may not be irreversible, it is equally true that firms that are proactive both economically and politically during the regulatory process are likely to be more successful in a competitive marketplace.

Who Profits is written for both business and government policymakers. A wider audience with interests in corporate performance, strategic planning, and even structural change in the economy would find the book of considerable benefit. It uses case studies to illustrate the implications of the interaction of competitive and regulatory forces.

Leone elaborates on a different perspective in each half of the book.

The first half of the book explores "understanding competition when government matters." Government actions directly affect the costs of doing business. The costs can affect the efficient scale of operations, the timing of investment decisions, and the competitiveness of firms within a single industry. Points are richly illustrated with examples from the fluorocarbon ban, water quality requirements, product safety, automobile fuel economy standards, and many others.

The second half of the book addresses "understanding government when competition matters." This section describes how political institutions respond to regulatory problems and the political criteria for their resolution. The book closes by offering guidelines for effective business strategy and effective government policy in a mixed regulatory/competitive environment.

The difficulties of managing in an environment that is part regulated and part competitive are not new to the electric utility industry. Although the balance may be changing, the fundamental issues are the same as when the regulatory structure was created. In contrast, the presumption of *Who Profits* is one of a competitive marketplace responding to regulatory intrusion—i.e., competition when regulation matters. The implicit question is: do competitors understand competition when regulation matters? The situation facing utilities is the reverse of this—regulation when competition matters. As competitive forces continue to grow in importance, the implicit question is twofold: do regulated companies understand competition when competition matters and, perhaps more importantly, do regulators understand regulation when competition matters?

However, the implicit focus on competition when regulation matters rather than vice versa does not negate the value of the book to a utility audience. The nature of the competition confronting electric utilities is very different from the competition confronting most other industries in the economy. Electric utilities are regulated monopolies, not free competitors. This situation leads to three points.

First, regulation is not going to disappear, although it will change. Electricity prices will continue to be set in a public arena. Rates of return on investment will be the product of a political process. Investment choices will be reviewed, in retrospect, for prudence.

Second, utilities will be exposed to an increasing degree of competition. This will happen not only because of technological and economic change, but also because competition has political legitimacy in American society and because customers and third-party suppliers will demand it.

Third, regulation and competition are contradictory. Thus, the introduction of greater competition raises fundamental questions about existing corporate and regulatory institutions. This third point especially makes *Who Profits* highly relevant. As the mix of regulation and competition is changed by government policy, each electric utility will be challenged to understand and act on the implications of those changes. EP

Bruce G. Humphrey is Director of Economics at Edison Electric Institute.

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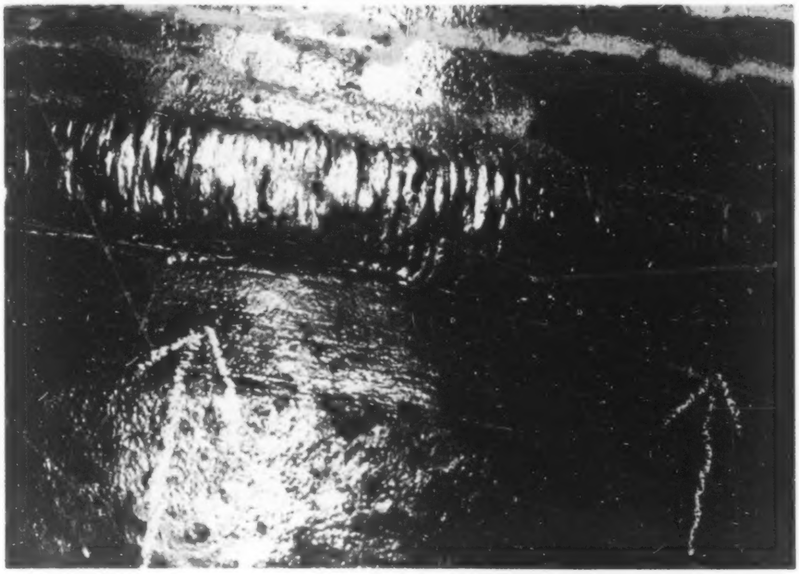
AFTER 15 YEARS, YOUR STEAM LINES NEED A HIGH LEVEL INSPECTION.

PROBLEM:

After fifteen or more years of high temperature stress, your hot steam lines could be in worse physical shape than you imagined. In fact, depending upon your plant's operating cycle through the years and the constant strain of expansion and contraction, the major pressure points could be literally cracking open at the seams due to creep, creep-fatigue or weld defects. What's more, if left unchecked, the outcome could be devastating in terms of lost revenue from a lengthy forced outage. So how can you prevent it? Where do you turn?

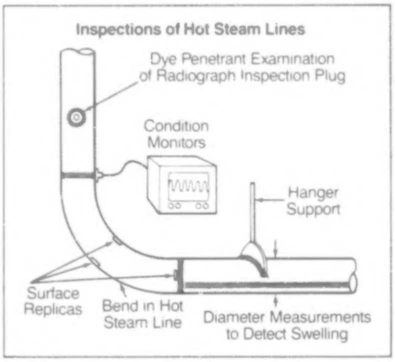
SOLUTION:

Turn to Babcock & Wilcox and our team of experienced life extension experts. It is imperative that you have your steam piping thoroughly and accurately assessed by people who are experienced in the nondestructive inspection and metallurgical analyses of main steam and hot reheat lines. Through the latest proven technologies like replication, satellite pulse ultrasonics, and acoustic emissions, we can provide you with the most cost effective, technically advanced approach to evaluate the condition of your steam lines. Our full service program includes everything from scaffolding and insulation removal to the repair, and if necessary, complete replacement of your steam lines. In addition, we can install our newly developed on-line system for monitoring the fitness of your steam lines.



Circumferential crack in steam line.

So, if you're responsible for keeping your power plant on-line, let the life extension experts from B&W share the responsibility with you.


Inspections of Hot Steam Lines
Dye Penetrant Examination of Radiograph Inspection Plug
Condition Monitors
Hanger Support
Surface Replicas
Bend in Hot Steam Line
Diameter Measurements to Detect Swelling

Capabilities include repair and replacement.

Write or call Manager, Dept. CIC, Babcock & Wilcox, Barberton, OH 44203. (216) 753-4511. Babcock & Wilcox, a McDermott International company.

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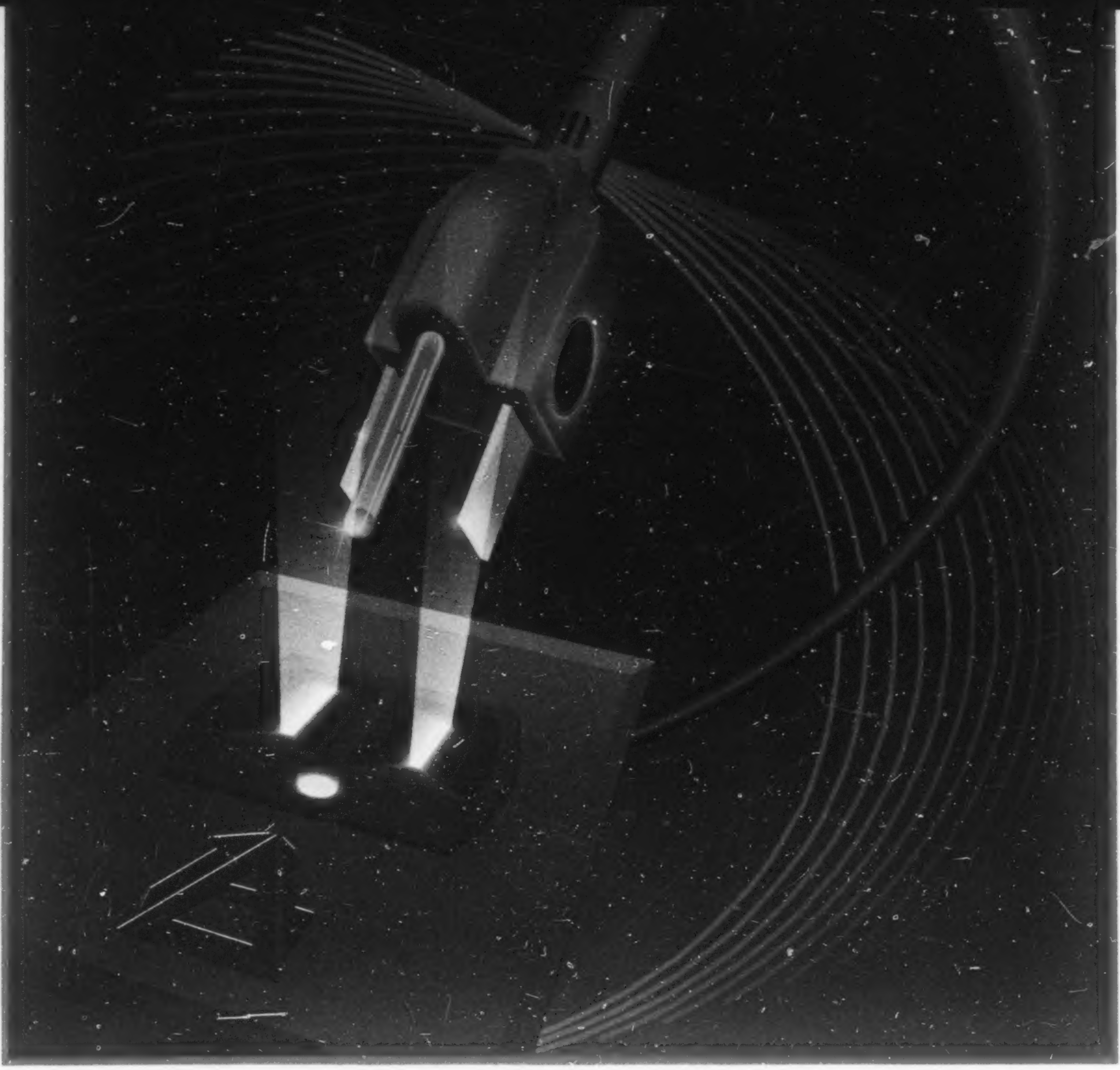
Babcock & Wilcox



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